THE JOURNAL

OF THE

ANTHROPOLOGICAL INSTITUTE

OF

GREAT BRITAIN AND IRELAND.

FEBRUARY 13TH, 1883.

Professor W. H. FLOWER, LL.D., F.R.S., *President, in the Chair.*

The Minutes of the last meeting were read and confirmed.

The following presents were announced, and thanks voted to the respective donors:—

FOR THE LIBRARY.

From the AUTHOR.—El Orígen del Hombre Sud-Americano. By Francisco P. Moreno.

—— Some Observations on the Darwinian Theory of the Evolution of Species. By Hugh F. Hall, F.G.S.

From the BUREAU OF ETHNOLOGY, U.S.A.—First Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution.

From the ROYAL ACADEMY OF COPENHAGEN.—Oversigt over det Kongelige Danske Videnskabernes Selskabs. 1882, No. 2.

From the PEABODY MUSEUM.—Fifteenth Annual Report of the Trustees of the Peabody Museum. Vol. III, No. 2.

From the COLONIAL OFFICE.—Statistics of the Colony of New Zealand for the year 1881.

—— Results of a Census of the Colony of New Zealand. April, 1881.

From the ASSOCIATION.—Journal of the Royal Historical and Archæological Association of Ireland. October, 1882.
—— Proceedings of the American Association for the Advancement of Science, Cincinnati. August, 1881.
—— Proceedings of the Geologists' Association. October, 1882.
—— Journal of the East India Association. Vol. XIV, No. 5.
From the ACADEMY.—Atti della R. Accademia dei Lincei. Vol. VII, Fas. 1, 2.
From the INSTITUTE.—Proceedings of the Canadian Institute. Vol. I, Fas. 3.
From the INSTITUTION.—Journal of the Royal United Service Institution. No. 118.
—— Journal of the Royal Institution of Cornwall. December, 1882.
From the SOCIETY.—Proceedings of the Royal Society. No. 222.
—— Journal of the Royal Asiatic Society, January, 1883.
—— Proceedings of the Royal Geographical Society. February, 1883.
—— Proceedings of the Asiatic Society of Bengal. July and August, 1882.
—— Journal of the Asiatic Society of Bengal. Nos. 249, 250.
—— Proceedings of the American Philosophical Society. Nos. 110, 111.
—— Bulletin de la Société de Borda, Dax. No. 4, 1882.
—— Journal of the Society of Arts. Nos. 1573–1577.
—— Bollettino della Società Africana d'Italia. December, 1882.
—— Scientific Proceedings of the Royal Dublin Society. Vol III, Part 5.
—— Scientific Transactions of the Royal Dublin Society. Vol I, Parts 15–19; Vol. II, Part 2.
From the EDITOR.—Revue Scientifique. Tom. XXXI, Nos. 2–6.
—— Revue Politique et Littéraire. Tom. XXXI, Nos. 2–6.
—— "Nature." Nos. 689–693.
—— American Antiquarian. January, 1883.
—— Revue d'Anthropologie. No. 1, 1883.
—— Bullettino di Paletnologia Italiana. No. 12.

The PRESIDENT announced that the Council had purchased two large albums of photographs and drawings, and a few books, at the sale of the library of the late Dr. Barnard Davis, and explained that they were placed on the table for the inspection of members.

Mr. JOHN B. MARTIN exhibited two albums of photographs of the West Indies and British Guiana.

Mr. A. R. COLQUHOUN read a paper "On the Aboriginal and other tribes of Yünnan and the Shan Country," illustrating his remarks by means of photographs taken by himself, and projected on the screen by the lime-light.

On the Aboriginal *and other* Tribes *of* Yünnan *and the* Shan Country. By A. R. Colquhoun, Esq.

(*Abstract*).

The speaker described at length the remarkable journey which he had recently accomplished across China from Canton to Rangoon. The details of this exploration have been published in the "Proceedings of the Royal Geographical Society" for December, 1882. Mr. Colquhoun dwelt especially upon the ethnology of the country he traversed, but the information which he laid before the Institute has since been published in his work, "Across Chrysee," or will appear in a work which he is now writing on the Shan Country. Between Canton and Nan-ning (one of the important towns on the Si-Kiang in Kwang-si), the inhabitants met with were pure Chinese. West of that, to the Yünnan frontier, a mixed population on the river and aboriginal races in the interior were found. Throughout Yünnan the chief population consisted of Shans disguised under a great variety of tribal names. Lo-lo and Miao-tzŭ aborigines were seen, as well as Thibetans under the name of Kutsung. On the west side of Yünnan Mohammedans were numerous, presumably the remains of the armies of Genghis Khan. The costumes were most varied and picturesque, and the Shans and all the aboriginal people were kind, frank, and hospitable, and in these respects, and in their feet being uncrushed, they offered a great contrast to the Chinese. In addition to the tribes met with, Mr. Colquhoun pointed out that there were in the north and north-west of Yünnan, as well as in Ssu-chuan, four divisions, namely, Li-ssŭ, Moso, Si-fan, and Mantzŭ. A remarkable similarity of language existed between the Lo-lo, Li-ssŭ, Si-fan, and Burmese.

Discussion.

Mr. Keane hoped Mr. Colquhoun would be able to supplement his interesting account of the Yünnan tribes by some more definite description of their physical types. Amongst them were the widely diffused Lolo people, who seem to extend in isolated groups from Szechuen, Kwei-chew, and Yünnan, down to the Tongking highlands,[1] and who by some travellers had been described as physically more like Europeans than Indo-Chinese. If so they would form a remarkable ethnical parting-line between the Mongoloid Chinese to the east, and the Mongoloid Tibetans, Burmese, and Siamese, to the west. But this point could not be determined without more accurate information on the outward characteristics of the Lolo race than was at present available. It would be

[1] "Il y a des Lolos dans toute la Chine Occidentale" (Abbé Desgodins, in "Bull. de la Soc. de Géog.," vol. xii, p. 410, 1876).

important to know whether the hair was brown and wavy or crisp, the complexion florid, the eyes straight and gray or blue, the nose leptorhine, and the features generally regular, in the European sense, as had often been stated, and any information on these points, from an original observer who had associated with these tribes, would be most acceptable. Mr. E. C. Baber had also recently visited them, and he makes the curious remark that they seemed half possessed with the idea that he was akin to their race. He described them as perhaps taller even than Europeans, well-built, muscular, deep-chested, with arched nose, and altogether evidently far more like the Caucasic than the Mongolic stock.[1]

Mr. CARMICHAEL wished to ask whether the divisions of certain so-called aboriginal races mentioned by Mr. Colquhoun, viz., white, black, red, &c., had reference to racial differences of colour, or had some other origin. He was the more desirous of putting this question because he was interested in tracing the existence of a red race in Asia, such as Professor Gennarelli argued had existed in Europe, of which argument Mr. Carmichael had given an account at the Bradford meeting of the British Association. Moreover, Mr. Carmichael believed that in Mr. Baber's narrative of his journey through South-Western China, there were some notices of the existence of such a race, and he should be glad to know if Mr. Colquhoun had met with similar traces. Mr. Carmichael also wished to ask whether Mr. Colquhoun could assign any theological or symbolical reason for the prevalence throughout the district of China, described in his paper, of an unequal number of tiers in the building of the pagodas.

Dr. OPPERT, while thanking Mr. Colquhoun for the information contained in his paper, thought that we should want some further details about the Mian-tse, the Lolos, and the other races mentioned by the lecturer. With respect to the distinction of colour in the names of the different tribes, he believed it referred to the political status of the various races, which condition is described by the prefixing of names of colour; black denoting dependency, as *Kara Khitai* (black Khitas) and others; white and yellow denoting supremacy, as the *White Tzar*, the *Golden Horde*, &c. The Mandarins in China have also different knots in their hats, according to their rank.

The PRESIDENT also took part in the discussion.

The AUTHOR, in reply, said that the colours white and black, &c., applied to some of the races mentioned, did, he believed, indicate dominance or subjection of race. With regard to the fact noted, that the pagodas were either 9, 11, or 13 stories high, he did not offer any mythologic or other theory in explanation. He thought it the part of the traveller to observe closely, and to leave the explanation to the *savants* at home.

[1] "Travels in West China," 1882.

FEBRUARY 27TH, 1883.

Professor W. H. FLOWER, LL.D., F.R.S., *President, in the Chair.*

The Minutes of the last meeting were read and confirmed.

The following presents were announced, and thanks voted to the respective donors:—

FOR THE LIBRARY.

From C. H. E. CARMICHAEL, Esq., M.A.—Giornale degli Eruditi e Curiosi. October, 1882.

From Professor AGASSIZ.—Annual Report of the Curator of the Museum of Comparative Zoology at Harvard College, for 1881-2.

From Dr. EMILE HOLUB.—Aus der Rotunde. By G. Waldhaus.

From Dr. W. J. HOFFMAN.—San Francisco Western Lancet. October, 1882.

From SEC. DE ESTADO Y DEL DESPACHO DE FOMENTO.—Movimiento de Poblacion habido en los pueblos de la Republica de Guatemala durante el año de 1881.

From the GEOGRAPHICAL SOCIETY OF LISBON.—La Question du Zaire Droits du Portugal.

From the AUTHOR.—Indian Pictured Rocks of Guiana. By A. Winter.

—— I Cranii de' Marsi. By Giustiniáno Nicolucci.

—— Nouvelles Archives du Muséum d'Histoire Naturelle, Paris. By M. E.-T. Hamy.

—— Oesterreichische Afrika-Expedition. By Dr. Emil Holub.

—— Sepulchral and other Prehistoric Relics, Cos. Wexford and Wicklow. Megalithic Structures, Cos. Wicklow and Carlow. By G. H. Kinahan.

—— Some Hindú Folksongs, from the Punjáb. By Lieut. R. C. Temple.

From the ACADEMY.—Nova Acta Academiæ Cæsareæ Leopoldino-Carolinæ Germanicæ Naturæ Curiosorum. Band 42, 43.

—— Atti della R. Accademia dei Lincei. Transunti. Vol. VII, Fas. 3. Memorie della Classe di Scienze Fisiche, Matematiche e Naturali. Vols. IX, X.

From the SOCIETY.—Journal of the Society of Arts. Nos. 1578, 1579.

—— Bulletins de la Sociétié d'Anthropologie de Paris. 1882, Fas. 4.

—— Boletim da Sociedade de Geographia de Lisboa. No. 6.

—— Proceedings of the Society of Antiquaries. Vol. VIII, No. 6.

From the SOCIETY.—Proceedings of the Asiatic Society of Bengal. November, 1882.
—— Proceedings of the Philosophical Society of Glasgow. Vol. XIII, No 2.
—— Schriften der Physikalisch-ökonomischen Gesellschaft zu Königsberg. 1880, Abth. 2; 1881, Abth. 1, 2.
From the EDITOR.—Correspondenz-Blatt. Nos. 1, 2, 1883.
—— "Nature," Nos. 694, 695.
—— Revue Scientifique. Tom. XXXI, Nos. 19, 20.
—— Revue Politique et Littéraire. Tom. XXXI, Nos. 7, 8.
—— Scientific Roll. No. 10.

The election of CHARLES FOUNTAINE WALKER, Esq., was announced.

Dr. GARSON exhibited and explained some photographs of cases of Hypertrichosis, upon which the President made a few remarks.

Notes on PHOTOGRAPHS ILLUSTRATING CASES *of* HYPERTRICHOSIS.
By Dr. J. G. GARSON.

The photographs which I exhibit were sent some years ago from Mandalay to the late Mr. Maunder (by the courtesy of whose widow I have the pleasure of showing them to-night), and represent the well-known hairy family, consisting of a grandfather, his daughter, and her son. The first was born in 1799, and was presented when a boy to the King of Ava; at the age of twenty-two he married a woman whose skin was normal, and had four children, three of whom (males) were normal; the youngest (a daughter), however, was hairy like her father. She, in due course, married a man whose hair was normal, and had two sons, both of whom were hairy. The history of the family has been recorded and commented on in two very able papers by Dr. Bartels, in the "Zeitschrift für Ethnologie," 1879. The presence at the Westminster Aquarium of a child from Burma, called "Krao," whose body is covered more or less completely with hair, having brought the subject before us, I thought it might not be out of place to recall to mind this interesting family. The photographs which I exhibit show only an increased quantity of hair over the face, but another in Bartels' paper, which I hand round, shows that on the hands and legs hair was also developed, as it was over the whole body. To this development of hair on abnormal parts of the body the name *Hypertrichosis* has been given, and it has been divided into two kinds: *Hypertrichosis universalis*, when it occurs over the whole body, and *Hypertrichosis partialis*, when only over limited portions, or in patches; the simplest form of this kind is a single hair developed in the centre of a wart, or a few hairs on a mole. The abnormality may consist, not in the locality of development of the hair, but in the time of development; thus the development of a beard and whiskers on young lads, which sometimes occurs, must

be considered abnormal. Or it may consist, not in the position of the hair-growth, but in the sex of the person; thus the development of whiskers on the adult female face is abnormal, though normal in an adult male. The abnormality of hair-development may, therefore, be of three kinds:—*Heterotopic*, as in the photographs now shown, and in the child "Krao"; *Heterochronic*, as in the case of boys developing a beard; or *Heterogenic*, as in bearded women. As to the cause of abnormal hair-growth, the Atavistic theory seems to me to be the most probable explanation, as here we would not have to trace the Atavus far back, and in the normal body we have the Atavistic germ present, though in a rudimentary condition. It would, therefore, be what Gegenbaur terms a palæogenetic form of Atavism.

Mr. ALFRED TYLOR read a paper on "The Homological Nature of the Human Skeleton," illustrating his remarks by means of photographs projected on the screen by the lime-light.

A discussion ensued, in which the PRESIDENT, Miss MARSHALL, Professor THANE, Dr. GARSON, Dr. BRUCE CLARKE, Mr. PARK HARRISON, and Mr. S. B. J. SKERTCHLEY took part, and the author replied.

MARCH 13TH, 1883.

Professor W. H. FLOWER, LL.D., F.R.S., *President, in the Chair.*

The Minutes of the last meeting were read and confirmed.

The following presents were announced, and thanks voted to the respective donors:—

FOR THE LIBRARY.

From Mrs. GUEST.—Origines Celticæ. By Edwin Guest, LL.D., D.C.L., F.R.S.

From the ACADEMY.—Proceedings of the Davenport Academy of Natural Sciences. Vol. III, Part 2.

—— Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Philos.-Histor. Classe. 1882, 100 Band, Hefte 1, 2; 101 Band, Heft 1. Math.-Naturw. Classe. I, Abthlg., 1882, Nos. 1–3, 4, 5; II, Abthlg., 1882, Nos. 3–6; III, Abthlg., 1882, Nos. 1–3, 5–7. Register X. Almanack, 1882.

From the SOCIETY.—Proceedings of the Royal Geographical Society, March, 1883.

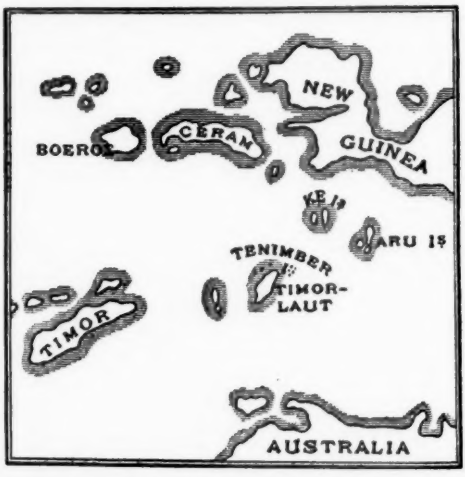
—— Journal of the Society of Arts. Nos. 1580, 1581.

From the EDITOR.— Bulletino di Paletnologia Italiana. Index and Anno 8°.
—— "Nature." Nos. 696, 697.
—— Revue Scientifique. Tom. XXXI, Nos. 9, 10.
—— Revue Politique et Littéraire. Tom. XXXI, Nos. 9, 10.

The DIRECTOR read the following paper, which had been communicated to the Institute by Mr. John Evans:—

On the ETHNOLOGY *of* TIMOR-LAUT. By H. O. FORBES, Esq.[1]

AFTER an interesting voyage, in which we called at *Gesser*, at the east end of Ceram; at two ports of New Guinea, and then at both the *Ke* and the *Aru* Islands, we landed, on July 13th, 1882, at the village of Ritabel, in the islet of Larat, which lies about fifteen minutes' sail off the north-east coast of *Yamdena*, as the northern of the two portions of *Timor-laut* is named.



SKETCH-MAP SHOWING POSITION OF TIMOR-LAUT IN RELATION TO THE NEIGHBOURING ISLANDS.

Our first concern was to get a house, for all the native huts are so very small that housing our baggage or working in them was quite out of the question. A site was obtained only after the most vexatious delays. In one place it could not be had, because superstitious fear was in the way, and in another because their neighbours of the next villages would be angry

[1] This paper formed part of a Report which was sent by Mr. Forbes to the Committee appointed by the British Association for the purpose of investigating the Natural History of Timor-laut, and was transmitted by this Committee to the Institute through Mr. John Evans, F.R.S., V.P.

if I built a *new* house, without their consent and advice. The difficulty was at last got over, after several days' *bitjara*, by my purchasing two houses at some distance and erecting them within the village boundary—this was not building a *new* house! Even after this the greatest difficulty was experienced in obtaining assistance and in fetching additional bamboos, as they grew near the dreaded Keleobar people.

Our first acquaintance with the inhabitants was on board the vessel before we landed. At first a boat came out to reconnoitre, and on its return to land, evidently with a favourable report, several boats came alongside and landed on us their crews of men only; on a former occasion of a steamer lying along the shore more to the south-east both men and women fearlessly scrambled on board. They were handsome-featured fellows, tall, erect, and with splendidly formed bodies, with their long hair carefully combed out, girt with black, red, and white patchwork bands round the forehead and occiput, the hair being transfixed with a long skewer-like comb, and then hanging down to the shoulders. It is dyed a rich golden colour, varying, however, according to the time between the application of the dye, from a dirty grey through a red or russet colour to the approved shade. Very few show true frizzled hair, and it is quite different from the hair seen on the Papuans of McClure Inlet, New Guinea, or among the Aru Islanders. Perhaps the dyeing of the hair may affect the growth of it: samples for microscopical examination will be, however, sent along with the collections. No clothing is worn, save the narrow T-shaped loin cloth, decorated at the end hanging down in front with red, black and white patch work, and adorned with sections of cowrie shells and with beads. The women wear a short sarong of native manufacture, with artistic patterns from the aloan palm (*Borassus flabelliformis*), bound by a broad belt made from the light stem of the same palm, with an elegant buckle which is often very richly carved, and is frequently the gift of the husband at the time he purchases his wife, and represents a sort of sign of engagement. The men wear numerous armlets made from the shells of a species of *conus;* the women also wear these, but frequently they have heavy anklets of brass and rings on their toes. Both sexes wear also armlets of brass or ivory or wood, carved like those worn by the Hill Dyaks of Borneo.[1] In their ears the women wear a graduated series of earrings in the lobe

[1] A collection of ethnological objects was sent home by Mr. Forbes, and a selection of them has been presented to the Christy Collection, through the liberality of the Royal Society. Mr. Read, on behalf of Mr. Franks, kindly exhibited a selection of specimens on the occasion of the reading of the paper, and has furnished a list which will be found on p. 23.

and round the helix, mostly of silver or gold. The men wear in the lobe very heavy *lor-lora* of gold, which stretch it often so as to break out the hold. Besides these they wear those of bone and ivory and ebony and of the tooth of the *dugong* (*Halicore*). Both sexes tattoo a few simple devices, circles, stars, and pointed crosses on the breast, on the brow, on the cheek, and on the wrists; and scar themselves on the arms and shoulders with red-hot stones in imitation of immense small-pox marks, in order to ward off that disease. I have, however, seen no one variola-marked, nor can I learn of any epidemic of this disease among them. Few diseases exist on the islands. With the exception of that curious skin disease so common among these races, whose cause has been referred to a species of fungus, of the shrinking of the tendons of the arms or hands from rheumatic affections, and a little scrofula, the people seem healthy.

They cultivate, in gardens made in the forest—just like those in Sumatra and in the uplands of Java—*cena* (*Batatas edulis*), *Dioscorea sp.*, and *Toeal* (*Janipha Manihot*) *Tevoe* (sugar-cane) and *Selaroe* (Indian corn), their staple food, and a little rice, but this grows very badly here: also two or three species of legumes. They grow cotton and make their own thread, as well as cultivate tobacco, whose leaves they chew entire.

The chief meal of the day lasts from about 8 A.M. till nearly noon, and consists of boiled Indian corn-meal pounded in the tridacna shell, mixed with mashed manioc and dry peas, along with a little putrid fish, and a very great deal of sagueir from the coco palm. Very few of the older men leave the meal sober. The women seem to eat in private, but the men repair to houses open at the gables, or to roofed sheds at a short distance from the village; the place, too, where they generally distil their arrack. This house serves for a common assembly room.

Their life from day to day seems very monotonous. In the morning, after arranging their hair, they remove from the trees the bamboo containing the sagueir or, *toeak*, collected during the night, and trim the stump for running during the day to supply their evening libations. While ascending the trees they invariably chant a song, or invocation, all using the same form of words as far as we could judge. At this task the lithe and elegant figure of the Larat man shows to the greatest advantage, the brown skin and yellow hair showing well against the grey stem of the palm as he ascends. Some of the men accompany the women, by prahu, to the gardens to fetch the necessary stores, while the older men and boys spear fish by the margin of the sea. In the clear calm nights the boats go to the bay in quest of fish by torchlight, and while not too far from the shore, the lit-up figures of the men and of the boats, and the reflec-

tion in the water, form a beautiful picture. They kill the fishes with barbed arrows, or with various forms of harpoon, and occasionally use hooks brought by the Macassar men; and sometimes they intoxicate the fish with rice steeped in poisonous climbing plants. The older men are incapable the greater part of the day, and in this condition are boisterously talkative and pugnacious. A quarrel arising often ends in bloodshed. The day is closed with the evening *toeak* collecting and drinking. The women employ themselves with their looms and in the preparation of the food, and in fact do most of the hard work. In time of war, as now, the village safety is watched all night by the villagers, eight or ten at a time in rotation, who dance the *Tjikaleleh* round a figure, the representative of their deity, or *Doeadilah*, each man beating with his hand a cylindrical drum, singing to its music a song, or invocation, with a wild and sonorous chorus. At the time of full moon they will often play for several days and nights without intermission.

Their arms are a shield, often elaborately carved and adorned with the hair of their enemies, bows and arrows, and various forms of iron-pointed lances and spears, which they use with the greatest precision, and a buckler of buffalo hide in which is stuck a long *klewang*, or sword.

Marriage is here, as was to be expected, the purchase of a woman from her parents—girls are all *ventoeng*, or profit. When a man fancies a woman he repairs to the house of her parents, taking with him a gift of *lor-lora* (earrings), and tells the father that he would like to have his daughter. The father then calls an assembly of all the people. Nothing can be done of such import as the disposal of a daughter without the advice, assistance, and witness of all the villagers; women and youths being admitted as freely to speak as the elder males. They reply to the wooer that if he wishes the woman indicated, he must search for gold earrings and elephants' teeth. No wife can be purchased without elephants' tusks, and consequently they fetch an immense price. They are brought chiefly by the Buginese traders, who in the last monsoon frequent the ports of Sumatra, where I have seen them give 200 to 300 florins for a tusk. In the west monsoon these tusks are brought to these "far far east" shores and exchanged for trepang and tortoise-shell.

The price of a wife is as much as three elephants' tusks, four *klewangs* (or swords), one small and two large gold and three large silver earrings, one bredak, one gold boental, one large gold boelang, and 30 fathoms of cloth. When the man has paid part of the price he may receive the woman, but she remains as a hostage in her relatives' house till such time as the

full price is paid. Sometimes the girl will run away with some man she has taken a liking to, with only the permission of her parents: in this case, on their return, the husband must pay 18 fathoms of cloth, one plate, five large and one small silver and two gold *lor-lora* (earrings), with one elephant's tusk. If, however, the woman has been, or is about to be, disposed of to another man, and she elopes with some other whom she prefers, she is forcibly taken possession of, and the man is punished with death.

When a woman is about to be delivered of a child she is bathed in and drinks a little of a hot decoction of mango and other leaves. When the child is born there is given to it to drink a small quantity of a warm decoction of *tabakaleat* (*Morinda citrifolia*), and it is bathed in the same decoction, to which is added a little baked kamirie (*Aleurites triloba*); it is then put to sleep in the *Siwèla*, or cradle. This is a flattish basket, made of woven rattan ropes, suspended so as to rock over a fire placed beneath, with only the spathe of a palm under its back, the head generally lying on rough rattan, and with a small piece of rag thrown over its stomach. The fire below the cradle, which not unfrequently sets fire to it, is partly to keep off mosquitoes, and partly to keep the child warm during night. The smoke is often so great as almost to suffocate the infant.

The series of crania which I am happy in being able to send shows well the effect of this treatment. The side of the hinder-part of the head on which the infant is placed is quite flattened. It would appear that the child is generally placed in the same position in the cradle, probably depending on the place of suspension of the cradle in the house, whether it lay on the right or on the left side. In some living infants the deformity is extremely marked. No sort of binding is applied to the heads at any stage of their youth, and I feel no doubt, from the manner in which I have seen new-born infants placed in the *Siwèla*, that the rocking of the infant in the rough cradle is the cause of the deformity. In some crania the deformity is not very prominent; but this may depend, perhaps, on cloth or some soft substance being used to place the child's head on, instead of the palm spathe in general use.

The medicine woman who assists at the birth receives as her professional fee a plate, in which is placed a tortoiseshell bracelet, ten sirie leaves, and twenty pinang nuts, one sarong, and one (?) Tjidakie. The person who bathes the child receives one square bottle of *Sopi* (arrack distilled from the saguier of the coco palm). The happy father announces the birth by firing off three shots from his own or his neighbour's G.R. Tower gun, and gives twenty plates of rice to the people in attendance.

When the mother puts her feet to the ground again, the husband fires off two more. When the child's hair is cut for the first time, the person who cuts it receives a fee of one gold earring, beads, and one plate of rice. A man may marry as many women as he can purchase, but few have more wives than one.

When a man dies, his children and brothers and elders of the village assemble to mourn—which has, however, neither outward sign nor sound. They bring with them, as far as I was able to ascertain, white or red cloth to wrap the body in, sarongs and other clothes, some coco palm arrack, and a little gunpowder. A pig is killed, but I am in doubt whether it is given to the assembled people to eat or laid with the dead body, which is then placed in a portion of a prahu cut to the length of the person, and with the cut-off end closed up; or if it is a richer person, or the *Orang Kaya*, a decorated prahu-shaped coffin is specially made. This is then (though not with the poor) enveloped with *chita*, or calico, and placed either on the top of some rock by the margin of the sea at a short distance from the village, or on a high platform erected on the shore about low-tide mark. Among the poor the coffin is often made simply of *gaba-gaba*, or stems of the sago palm, pinned together. Sometimes the platform is erected on the shore above high-water mark, and near it is stuck in the ground a tall bamboo, full of saguier, and suspended over a cord are many batatas for the use of the dead man's *Nitu*. Two days after the burial, the family go to bathe and wash their hair; and after two days more they search for ten fishes and one tortoise wherewith to give a feast, which is finished with sirie and arrack *ad lib.* All who die in war or by a violent death are buried, and not placed on rocks or on a platform, where only such as die naturally are deposited. If a man lose his head in war a coco nut is placed in the grave to represent the missing member, and to deceive the spirits. When the body is quite decomposed, his son, or one of the family, takes the head and deposits it on a little platform in his house, in the gable opposite the fire-place, while he places the atlas and axis in his *lovoe*, or sirie-holder (which every man, without exception, carries about with him), to ward off ill luck. The dead man goes to Noesa Nitu, or Maramatta (near Ceram). On this island no one dare land, and it is with fear and great vigilance that they sail past it.

I am told by a man from a neighbouring village that their custom is to place the dead body in the open palm-stem coffin, in which the body soon decomposes, and that thereafter the bones are collected and placed in a wooden prahu-shaped coffin and placed by the edge of the sea. This cannot be the custom in all cases, for I have seen very many of the coffins of wood

and of *gaba-gaba* fallen to pieces, and the bones strewn on and around the rock on which it had been deposited; while all along the shore I have picked up femora, occipital and frontal bones, quite uncared for, and with the human bones I have seen jaws of pigs.

After death the goods of the deceased, if not heirlooms, are divided among his children: those living in a large house getting more than those in a small one. On the death of a parent the children remain with the survivor.

When a man is sick, the medicine man speaks first to his (the sick man's) *nitu* (swangie ?), or evil spirit, or part of self living in the earth, having power over the body of the man, if not appeased for ill; laying out for it a little rice and arrack and fish; thereafter he gives medicine to the sick man. There is no special medicine man, but several among the people pretend to knowledge in the science, and are recognised by the others as gifted. One man, while we were very sick with fever, came to the house extremely anxious to be allowed to give us medicine. He produced a few leaves which were not to be eaten, but to be kept about the person or preserved, and gave me a small smooth pebble, which if rubbed first on the tongue, then brought slowly down the mid-line of the body from the lower lip to the umbilicus, where it had to be allowed to rest a few minutes, would cause all sickness to leave the body. Before giving me these articles he placed them before him, repeating some formula. Before making any long journey, or making war, or doing any important work, he goes to propitiate his *nitu* (swangie ?), and make it some offering. In what locality in the forest, or by the seashore, or where else the nitu resides, or is supposed to reside, I have not been able to obtain information.

When it is required of a man that he make an oath, the villagers assemble; and when a fowl or pig has been killed it is offered to *Doeadilah* (or the *Toehan Allah*). It is then cooked, when the person or persons of whom evidence or information is required relate what they have to tell; thereupon all partake of the fowl or pig. Whoever has spoken falsely will be seized with sickness or will die soon. Nearly the same custom prevails among the pagans of the Passoemah Lands in Sumatra, where I spent some time last year; the parties on both sides of a dispute, who are to swear, repair each with his *Repala Kamping*, or chief, to the grave of the Nene Poeyang of his own Monga: that is, to the grave of the first father of the village, and there, after each has given his version of the matter, they partake of food cooked over the grave. Sickness or misfortune will befall the person or the village of the one who has sworn falsely.

Before drinking they extract a few drops from the vessel, and flip it upwards, repeating a formula—in this offering a little to the deity.

Some Virdute men were one day on a visit to the village of Ritabel, and one of them having deposited his loin cloth on a beam, had it stolen and could not find the thief. Several days afterwards he sailed across from the opposite side of the bay where he was staying, bringing with him a small flag on the end of a slender pole. This he erected on the spot where he had lost his loin cloth, and looking upwards repeated a long imprecation against the thief and the village, then withdrew the pole and returned without accosting any one.

All the villagers have almost the same local standing: no man recognises a superior; even the *Orang Kaya*, or head of the village, holds only a nominal position, and he is elected by the general vote of the village. Having fixed on the person whom they desire to be Orang Kaya, they announce to that individual the fact of his election. If he accepts (he may decline if he choose) he receives from the village an elephant's tooth and a gold earring, which seem to be his whole fee and sole perquisite.

Slavery is greatly practised among them. If a man steal from his neighbour, or has a debt owing to him and cannot restore the things stolen or pay his debt on the disposal of all his goods, he becomes the slave of him from whom he has stolen, or to whom he is in debt; but his friends can redeem him for a heavy ransom. If a man accuse another falsely of being a thief, or speak ill of him without a cause, so as to make him ashamed before the village, he may become the slave of that other, but is redeemable by a high ransom. It is a custom of the Tenimber tribes to seize from boats at sea, or where they can, men and women as slaves. It is not long since the Larat people had a Chinaman in bondage for many years, having kept him concealed in the interior. The Buginese also carry on a considerable traffic in slaves, bringing them from Hoemaheùa and from the east coast of Celebes.

The pomali signs of the Tenimber people, besides the branch of a palm inserted in a bamboo stuck in the ground in front of the place tabooed, I have been unable to discover.

The men vary very greatly in stature: some are short and thick-set, and reach little over 5 feet, if they even attain that height; the greater proportion are tall, well-formed men of about 5 feet 11 inches, but some stand well over 6 feet, splendid-looking fellows with perfect frames and magnificent muscles. The women vary in like degree, some being short and thick, scarcely reaching 5 feet, while others are as tall as the taller of

the men. In their walk they stride forward in a jerky, bouncing style, which gives to the head a sharp nodding motion, their hair, when combed out behind, heaving up and down. Their whole motion is full of grace, but so proportioned are they that it really seems scarcely possible for them to move ungracefully. As children many of them are really pretty in face and figure; numbers are frequently disfigured by enormously distended stomachs and abdomen, which induces a sad expression of countenance and a sickly face. The youths are splendid examples of the human form; many of the girls are handsome, and a few are even beauties, with pensive eyes, delicate features, and faultless in contour of body and limbs. As they pass into the married state the features become coarser, but on the whole neither sex can be called ugly.

Hair is abundant on the head, in the armpits, on the pubic region, and often on the abdomen as far as the umbilicus: the legs are more hairy than the arms. On the face, many of them assiduously pull it out, as the Malays do, keeping in their *lovoe* a small bamboo pincers for the purpose, by the aid of the mirror which nearly all possess in the top of their tobacco box. A few have rather thin whiskers and beard. Their coiffure seems to depend on the kind of hair nature has given them, whether straight or frizzled. When frizzled it is arranged in a mop, and when straight is combed back, to hang down in a "cataract" behind. One of their most pleasing morning occupations is to comb out their yellow auburn or golden hair, which they have washed and dyed the night before with the ashes of the coir of the young coconut, using the water collected in a prahu, or their shadow cast on the ground, as a mirror.

The young coconut is preserved with great care, for one sees in the neighbourhood of the village small huts, shading circular coral-rimmed depressions, in which these are stored.

In their hair-combing they take the most evident pride, and the vanity with which they bind various coloured cloths round the head from brow to occiput is amusing. Their favourite colours are red, blue, and white; and their head-cloths are often made by themselves of patchwork of these colours in longitudinal and vertical rows. These patchwork bands are often affixed to a bamboo girdle, and worn as described. Among the women hair is abundant on the head, without being very profuse. In the armpits it is also very abundant. They do not dye their hair. Many have quite straight and black hair, not to be distinguished by the eyesight from that of the Malay. Others have more of the Papuan frizzle. They take little or no care of the hair; they comb it but seldom, simply twisting it into a knot behind, where it is often transfixed with a neatly ornamented comb. The men

frequently cut their hair; but those who wear a mop have not the unravellable mop of the Papuan seen in some regions. One day, some of them coming into our house and seeing a pair of scissors, begged its use to cut their hair. It was granted, and one at once started as haircutter, and as soon as it was known that such operations were going on a crowd came one after another begging for this luxury. We tried to get some specimens of their hair, but when they saw that we desired to keep it they became quite afraid, begging it back, for they said they would die. They gathered up every scrap, and had not a kind wind assisted us, and blown some scraps to a little distance out of their sight, which my wife and I marked down, noting the subject from which it had come, we could not have obtained any specimens. In Sumatra I once noted a man most carefully bury the scraps after paring his finger-nails. Perhaps there exists there also a superstitious dread of any part of the person being in possession of another. One day, when I purchased a skull of the father from his son, something of the same dread appeared. For as soon as the bargain was completed, the seller took from his *lovoe* (or sirie-holder) a piece of areca-nut, and setting the skull before him placed the nut between the teeth, and after repeating some sort of invocation handed it over to me. Also, when I purchased a great fish from an old man, which he had just taken with great difficulty, he would not hand it over to me till he had cut off one of the pectoral fins to return to the *nitu*, or soul of the fish, lest he should come by harm.

The colour of the Timor-laut man is a rich chocolate brown; but here and there among them occurs a quite black-skinned individual, who is at once remarkable as being an exception to the prevailing colour. The texture of the skin is by no means coarse; often rather smooth and soft.

In feature the forehead retreats slightly from the prominent superciliary ridges, as seen in profile. *En face* it is somewhat flat. In the Malay region, in some the cheek-bones are very prominent; in others, again, they are as little observable. The brows are low, but not conspicuously hairy. The eyes are small and narrow, and in a few a slight obliquity is observable. In a few also the eyeball is very prominent, but in others by no means so. As regards the nose there are two distinct forms: one in which that feature is very low between the eyes, advancing with a straight dorsum to a *retroussé* tip, which discloses both nostrils conspicuously, the tip being markedly pointed. The other form is that in which the dorsum is higher between the eyes, is straight, rarely arched, and the tip pointed, depressed, and incurved to form a thick fat septum. In this form the nostrils are almost concealed, and the *alæ nasi* much inflated. *En face*

both dorsa are straight, the first form exhibiting the nostrils fully, and the septum; the second form with dorsum compressed slightly in the middle, the nostrils not seen save slightly, and the *alæ nasi* inflated. The upper lip is prognathous; the lower somewhat retreating, or orthognathous. The teeth of the upper jaw overlap those of the lower jaw, but this is not invariable, many of both sexes having the teeth evenly meeting.

From the Malay region the face rapidly converges to the small chin, with the cheeks hollow. It is not protruding, is round, and rather well shaped.

The ears are small, but a good deal disfigured by the large, irregularly bored and slitted holes made in the lobe, while the helix and scaphoid fossa are put out of shape by the series of smaller holes in which the earrings graduate from above downwards, from small to greater.

From the occurrence of straight hair among these people, and of the round-tipped *retroussé* nose, and the rich brown chocolate colour, I am led to suspect the intermixture of Malayan, or perhaps Polynesian, blood with the Papuan. The absence of hair on the face would seem to lend some weight to this suspicion. But I have seen in Sumatra, and inquired into their family history, true Malays with curly hair, and favoured with profuse whiskers and beard, as well as very hairy-breasted Malays (in Soerabaija); the straight hair and Malayan type of pose do not always coincide, though in some cases they do so markedly. I noted women in Larat with perfectly straight hair, and yet with the Papuan type of nose and face. In others frizzly hair, with a nose half Papuan, half Malayan. I noted also a young woman with quite the quiet, docile features and bearing of a Malay girl, and almost hairless body. All, however, have the boisterous and inquisitive manners of the Papuan.

That the Malay race has spread to this island, or that some connection with the Indo-Malayan region has taken place, seems to be indicated by the presence of the Tangalunga (*Viverridæ*), so commonly carried about by these people, and of the herds of buffaloes on the mainland, animals quite foreign to the Austro-Malayan region, which must have been brought by the Malays, though it is incredible that in their small prahus they should bring so great a quadruped as a buffalo. The presence of a small dove called in Java the *tercoocoor* (*Geopelia striata*) may also point in the same direction.

One of their customs is to kidnap and purchase slaves wherever they can. Perhaps in this way some infusion of non-Papuan blood may have come. It strikes us, too, that we have seen in an old map of Timor-laut two stations marked "Factory," indicating, I presume, footsteps of the East India Company.

Of the intellectual characteristics of the Timor-laut people I have formed no mean opinion. They are very clever carvers of wood and ivory; the "frame-heads" of their prahus especially attract attention by the elegance of the devices and the excellence of the workmanship. The central pillars in their houses are also most elaborately carved. They are intelligent workmen, and quick at understanding. They have often pointed out to us the beauty of the Bay in which they live, a circumstance which struck us very much, as in Sumatra, when the most gorgeous of landscapes has burst on our view, not one Malay has ever in our hearing, or by change of countenance, expressed the slightest surprise or admiration; while out in the forest they will pluck such bright flowers as they may meet with, and arrange them with taste in their ordinary comb, which is perforated for the purpose. Such a circumstance has never once come under our cognisance among the Indo-Malayans.

Their moral characteristics are such as are to be expected from an uneducated people subject to no restraint. These are all of a selfish nature. For one in distress they will show no sympathy or pity, if it will deprive them of anything. To give anything for nothing is an exceedingly rare circumstance among them. They have no feeling of gratitude. However often they may have received gifts from us, they have very seldom given anything in return. Even within an hour after receiving some gift, they will bring in exchange some necessary we have asked for, and demand the most exorbitant price for it, and will often take it away without accepting even a high price for it. Where they think there is no chance of detection they will lie most deceitfully and steal, though their *adat*, or custom, punishes this crime with slavery, from which the thief can be ransomed by a great sum. When sober they are good-natured, and do not seem to keep up their wrath, nor harbour revenge against an individual, though a man of a village with which they are at war they will unhesitatingly shoot down or stab, if they find a safe chance. When excited they are savagely cruel. They are very suspicious of each other and of their neighbouring villagers, and are ready to quarrel if one gains more than another. One man rarely undertakes any piece of work for this reason, as dissensions immediately arise; a little company of the whole village must have a share. When my house was building the Ritabel men were afraid of the Ridool and Waitidal men (two neighbouring friendly villages), because if these did not get a share in what I was to pay for a *new* house, they would make a disturbance. As it was, I purchased two old houses and re-erected them. Yet when I visited Waitidal these people exhibited the greatest animosity

against the Ritabel men, saying to me that they had exacted a most exorbitant price for the bamboos they brought me, and advising me to leave Ritabel and make a house in Waitidal, and *sell my goods there!*

Neither sex is very faithful to the marriage relation, but no immorality or indecency comes to the public gaze. In their speech they are more moral (as far as I can judge) than the Javanese or Malays. They have neither obscene carvings nor rites.

Their treatment of their children we both observed to be invariably kind and affectionate. The fathers carry about the children in the evening, "smelling" them and fondling them with every sign of affection. Even good-tempered children of other villages are carried about and petted by their neighbours. The mothers decorate their children profusely with beads and necklets, and encase their little arms in a perfect buckler of shell armlets. The youths and boys play in the evenings most vigorously, and the younger fathers often join them, while the crowd of villagers which always looks on takes a lively interest in the games. These games much resemble those of children at home.

A great amusement seems to be the sailing of miniature boats elegantly made out of *gaba-gaba* (or sago palm stems), which they enter for the championship in elegant regattas. They build, also, forts of sand, and defend them against their comrade foes with balls of wet sand. The shout from the onlooking crowd which hails a good hit tells of the interest excited. Most interest, however, is taken in a game which is one more of skill and precision than the others, played with discs cut off from the top of *conus* shells. Each player has two of these quoits. Each places one in a little depression in the ground, and from a crease at some distance he plays with the other quoit, so as to dislodge one from the row. If he fail to hit he has to return to the crease to play again, but if he *score* he plays from where his quoit rested; and when he fails the next in turn plays. Passing his right hand holding the disc round to his left side as far as he can stretch, steadying it with his left hand, he takes in this position steady aim, calculating with a glancing eye the spot he intends to hit, then taking a run forward a few steps to the crease, he delivers with all his might. Not only do the young lads and boys engage in this game, but even the grown-up men, amid much laughter and shouting. From a very early age the children begin to wade about the shallow margins of the sea, with bow and arrows in quest of fish, till, when they have reached an age of six or seven, they are quite expert in the art. And to see a youth draw a bow or throw a lance is a fine sight.

The Timor-laut people recognise no superiors. Though they have an *Orang Kaya* he has no more voice than any other full aged man. The "old men's" voice has some weight with the younger men, but they all speak out their mind boldly and fearlessly, objecting or agreeing, while the children look on, and the women—who have indeed a freer life, and are more independent and better treated than the women in many of the more civilised parts of Sumatra—are not backward in expressing their opinion. The general voice is the law of the village community.

Punishment for small offences is by fine, exacted by the verdict of the village. Great offences breed a quarrel, ending often in the death of one or more of the parties.

They have bravery of a kind, having little fear of death, whether occurring in battle or in the course of nature. They generally fight from behind trees, and a large number of their bucklers are made to protect them *à tergo!* When wounded, they at once retreat. They are not bloodthirsty when not excited to the height of passion. From what we have seen of the villagers of Ritabel, and others who have accepted the authority of the Dutch Government, they are rather peaceably inclined, and are now rather disposed to settle a dispute by payment or restitution instead of quarrelling. Though the Post-holder recently placed in Larat has absolutely no power over them, and dare not order as he cannot enforce, they are so little bloodthirsty that they make no raid on the Keleobar people, who have assassinated several of their people treacherously, and though their trade with the Macassar people (who bring them all that they most prize—gunpowder, guns, clocks, knives, arrack, &c.) is entirely at an end, because they can no longer search for trepang and tortoiseshell, they choose to wait the coming of the Dutch Commission to settle the dispute. If, however, one of their enemies fall into their hands they become perfect demons, and execute the most horrible cruelty on their still living victim, before affixing his quarters on their public places.

The islands are very sparsely populated. Mr. Wallace, in his "Australasia" (page 432), speaks of a black, frizzly-headed savage people living in the interior. There are, however, absolutely no inhabitants in the interior of Timor-laut. Only along the coast are there any villages.

The language of the Larat people is, in a large number of words, similar to that spoken in Ceram and in Batoe Merah, a suburb of Amboina. On the mainland many of the villages have their own dialect or language. In the island of Maroe, to the north-west, there is a colony of Mohammedans, mostly from Tidoe and Ke.

The people of Timor-laut recognise some supreme existence whom they call *Doeadilah*, and in their houses, over the principal seat, or *dodokan*, facing the entrance, is an image of the deity, with at its side a platter, or *oebilaan*, on which a little food and drink is placed, whenever they themselves eat. They carry with them also small images—if on tortoise-hunting expeditions, with a tortoise carved in front of the figure, and if on fishing excursions, with a fish in front.

Their houses are little more than floor and roof, elevated four or five feet above the ground, and entered by a stair through a trap-door cut in the floor, which is shut down at night. In front of the door is a seat of honour, with ornamented supports and a high carved back, on the top of which is placed the image of the deity as we have already described. On each of the four sides a space for sleeping is raised some 9 to 12 inches above the level of the *Rahanralan*, or floor of the house. The people sleep on small, neatly made bamboo mats, and rest their heads on a quadrilateral-shaped bamboo. In one gable is the *Foean*, or fire-place, and opposite to it, on a trellis-work platform, is placed the cranium of the father of the head of the house. Indian corn and other comestibles, and various articles are stored on little platforms stretching between the rafters, and their scanty clothing is suspended from the roof by elegantly designed and carved wooden devices.

Both men and women chew sirie and betel with chalk; the latter also grind down their teeth almost to the alveoli. The men, and some of the women also, are great tobacco chewers, but they do not smoke. Paraffin matches were offered to them as a gift, but they refused them, preferring to make fire by rubbing two sticks together. The advent of civilisation, in the person of an Amboinese, has introduced the thin end of the wedge in the matter of smoking, and already some of the younger men have begun to smoke. Ten years hence it will doubtless be an established habit.

The inhabitants of Timor-laut make their own spear-heads out of iron, and are skilful workers in copper and brass.

For musical instruments they use the gong (introduced by the Bugis traders), cylindrical iguana-skin drums, and a species of two-stringed violin made out of bamboo.

The climate is very unhealthy. After about nineteen days' residence in the island, all were seized with a fever of a very pernicious kind. The water is very bad; as there are nowhere any rivers, water must be collected from holes in the coral into which the rainwater penetrates. Exposed to the south-east wind, which blows incessantly throughout July, August, September, and October, it invariably produces a relapse of the fever.

Of the hunters who were on the island with us, one died from the effects of the climate within twenty-five days after our return, and another seemed to be in a dying condition.

The native's divisions of time are the sun's rising, height, and setting; so many moons of *Varat* wind and rain bring round the Timor sun and heat, and mark for them their *seasons*.

On the whole, the Tenimber group, though very interesting from a natural history point of view, can never arrive at any great degree of prosperity. For a time the forests may yield a rich harvest, and the seas contain much fish, trepang and tortoises; but the soil is so scant that little save Indian corn and a few roots can be grown with anything like profit. The climate, too, is very insalubrious. The people, however, are apparently easy of civilisation, and doubtless under the Dutch administration, which has now been set up in the islands at Larat and at Serah, great strides will be made in this direction, unless the "fire water" of Amsterdam and the arrack of Java work in an opposite direction. Amboinese schoolmasters will shortly be sent, we understand, to give them the rudiments of education. Travellers visiting these distant isles in the next generation may find, we hope, a population who have forgotten their incessant intertribal fights, and who have laid aside the spear and bow, without which he dare not now stir beyond the village palisades.

APPENDIX A.

Kindly furnished by C. H. READ, Esq., *British Museum.*

The following specimens were exhibited to the meeting, on the occasion of the foregoing paper being read:—

1. *Oeal lelah*, a comb, somewhat European in shape, made of a hard brown wood, inlaid with plates of bone, pierced in open work with elegant native designs. These plates are neatly attached to the wood by means of strips of thin rattan. In the middle at the back is a socket in which the following specimen (No. 2) is fixed. This comb is described as being "worn in the hair horizontally, decorated with feathers during the Sekalelah (*Tjikaleleh*), or war dance."
2. *Ornament of blackened wood*, resembling in form the fore part of the keel and prow of a canoe, having a peg at one end to fit into the comb (No. 1). It is carved with spiral ornaments, and has two birds' heads projecting near the middle. It is worn in the comb during the Sekaleleh, and in going out to war.

3. *Lora*, man's earring, made of ebony, with a strip of bone across the lower part. The form is graceful, somewhat pear-shaped in outline, the upper part open to allow the ring to hang in the ear.
4. *Lora*, man's earring of brass, in form exactly like the eye of a hook and eye. From the island of Vordate.
5. *Spindle* (*sulcano*) *and basket* (*soelveli*), *containing the raw cotton.* The spindle is neatly made with a five-sided pointed head, the whorl being a disc of coconut shell. Another specimen in the collection has a whorl made of European earthenware. The basket is ingeniously plaited in rattan, having three rows of bosses projecting round the base.
6. *Sorko*, described as a "spoon used in cooking." In form, however, it is more like a knife, made of blackened wood, and having the figure of an animal on the oblong end of the handle.
7. *Kiliwa*, "suspended from the roof for hanging spoons from." Of these there are three in the collection, all of different forms, the only feature in common being a number of points on which to hook the spoons.
8. *A kind of net of plaited leaf*, suspended from the roof for holding the *Phenga* or eating cap (*sic*), or for plates, &c. A clever contrivance.
8. *Two anklets of brass worn by women.* Heavy penannular ornaments, having at the ends rude representations of the human face in relief.
10. *Rattan cradle* (*siwèla*). This is the form described in the text (p. 12).
11. *Figure head of a prahu of wood*, representing a pig (?), the hind legs bent inwards. The whole is kept in place in the boat by a bolt passing transversely through the base.
12. *Belt* (*calco*), a broad band of the stem of a palm fastened by a flat peg passing through loops on the ends which fit into each other. This is mentioned in the text.
13. *Drum used in the war dance.* This is the same general form as the New Guinea drum, but of a more simple outline, circular in section, and diminishing gradually to the base where there is a rim; the end is open. The top is covered with the skin of a snake or lizard.
14. *Buffalo hide corslet.* There can be little doubt that this is a native copy of a sixteenth century European cuirass, although it stops beneath the arms, and would thus be no protection for the upper part of the chest. It is the more probable as Mr. Forbes obtained from Ceram an

exact copy *in brass* of a sixteenth century morion, also included in the collection.

15. *Shield of the type common among the wild races of the Archipelago.* A long narrow piece of wood, somewhat curved longitudinally, with carving, and some traces of colour, and with tufts of hair ornamenting the front.
16. *Pomali* sign; "to represent the skull of father, which occupies a place in the house facing the *toean*, or fire-place." This appears to be in case of a father dying in battle, and to be an improvement on the coconut mentioned in the text. This specimen is formed of a rudely globular block of wood, one side representing a human face, the eyes and teeth made of pearl shell and black wood.
17. *Lælæni*, a pillow. This is exactly the Chinese pillow, being made of bamboo squared, and the edges somewhat rounded, to be more easy for the neck of the sleeper.

All these specimens are described as having been obtained in Ritabel village, Larat, Timor-laut.

APPENDIX B.

Vocabulary of Words used in the Ke Islands and in Timor-laut (Larat).

Compiled by H. O. FORBES, Esq.

Vocabulary.	Ke Islands.	Timor-laut (*Larat*).
Anchor		Vatoe.
Anchor, cord		Warat.
Anklets		Riti.
Ant	Kirkim	
Arm	Aroemoed	Vetit.
Arm, fore		Tanoevoer.
Armlet of shell		Sistoh.
Armlet of ivory		Lela.
Ashes	Knaboen	
Bad	Sisian	Sian.
Bamboo	Temar	Temar.
Banana	Moeoe	Mooe.
Bat		Yabar.
Batatas		Erna.
Bathe	Loeroek	Titloeroeita: Taliroe.
Beads		Maroemoet.

Vocabulary.	Ke Islands.	Timor-laut (*Larat*).
Bed	Rin	Taïta.
Belly	Eboen	Ewoen.
Belt, of sheath of *Borassus*		Calco gnaman.
Belt, woman's		Calco.
Beautiful (view)		Laboeang.
Bird	Manoet	
Black	Metmétan	Natoan.
Blood	Larah	Lara.
Blood-vessel		Oerat-vali.
Blue	Timtoem	Niflali.
Boat	Habo	Ra.
Body	Oeling	
Bone	Loerin	Loren.
Bow	Temar	
Box	Sungoh	
Boy	Kaet-roet	Kosokoe.
Breast, male and female	Boeboer : Sois	Boeboe : Soesoe.
Bring		Mleba.
Butterfly		Aikoean.
Cage		Rahankan.
Cap, of Calabash, for eating out of		Phenga.
Chain, girdle worn by women		Eboer.
„ cord part of it		Eerit.
„ button for fastening		Matan.
Chalk		Yafoer.
Child, male ; female	Yanad	Kosokoe-vata ; yanad.
Chin		Demid.
Chopper	Gnir	
Clouds		Moetan.
Coat		Ravit.
Coco-nut ; young ; old	Gnoer	Gnoer ; gnoer - voca ; gnoer-ka.
Cold	Tabrinin	Ridmia.
Comb		Oeal.
Come	Modo	
Cradle	Wel-wel	Siwèla.
Dance		Tabar.
Dance song		Sekilela.
Daughter	Yanad vat vat	Yana ma vata.
Day	Hamar	
Deity	Doead	Doeadilah.
Doll		Taran.
Door	Fid	Moean.
Ear	Aroen	Aroed.
Earrings (of gold) ; earrings (of dugong)		Lor lora ; welwelak.
Earth		Elanoe.
East		Timor ; mololan.
Eat	Taan	Mame, Tufnan.
Eclipse		Rarasok, faria.
Eggs		Mata-teleor.
Evening		Leriwava.
Exchange		Heloe.
Eye		Mata.
Eyebrows		Mata-toevin.

Vocabulary.	Ke Islands.	Timor-laut (*Larat*).
Face	Mahad	Wahad.
Far		Roro.
Father	Yamam	Yaman.
Fathom	Ref	Erefa.
Feather	Manvoen	
Female		Vata.
Finished	Eenrok	Rokröok.
Fire	Yaf	Yafoe.
Fish, to fish	Woeoet	Woevet, ián, dawawóót.
Flesh	Hin	Wawoe.
Flower		Ofoeven.
Fly	Raboer	
Foot	Eaad	Eadroan.
Forget	Oebloefang	Rablufan.
Fowl	Manoet	Manoet.
Friend[1]		Ridang.
Fruit	Boeal	
Give		Malabokoe-ria,
Go	Elboea	
Gold	Mas	Mas.
Good	Boek	Lolin.
Great		Dawan.
Gum		Natal.
Hair	Moeroet	Woeoet.
Half		Tera.
Hand	Limad	Lemad tanan.
Hard	Oesin	Nangrebat.
Harpoon		Teär.
Head	Oed	Oeloed-watoel.
Hear	Mdenar	
Heel		Ratawoe.
Here	Odanie	Hawobrokia.
Honey	Wenan	
Hot	Nanch	Nanganeh.
House	Rahan	Rahan.
How many	Hongakbe	Efira.
Husband	Brinran	Hawan.
Indian corn		Selaroe.
Iron	Tman	
Island	Nuhoe yanet	
Knee	Ead toer	Toerad.
Knife, sheath	Gnib	Enko, akoeda.
Know, don't		Wolemgka.
Kris		Sariba.
Large		Dawon.
Leaf		
Leg	Eäng (man's leg), eäm (another)	Eäd.
Lightning		Fitik.
Little	Roet	
Loincloth		Ro-ok.
Long	Bloöl	Blawat.
Lorie		Leloer.
Louse	Oet	

[1] In Yamdena (mainland) friend is *Kes*.

Vocabulary.	Ke Islands.	Timor-laut (*Larat*).
Male		Trana.
Man	Tomata	Tomata.
Man, young		Ververun.
Manioc		Toeal.
Many	Abeed	Leher.
Marry	Tafan	Sefa.
Mat	Dar	
Monkey	Boeoe	
Moon	Oean	Voelan.
Morning		Ververra.
Mosquito	Emimoes	
Mother	Nen	Liti.
Mouth	Guen	Soemar.
Nail	Kukud	
Nail, finger	Kukud	
Navel		Foeart.
Neck		Relad.
Night	Dedan	
No, simple negative	Waid	Walafa, wah.
No, refusal of anything	Naä	Nafena.
Noon		Lera si lola.
North	Madmar	Mormar.
Nose	Nieroen	Nieroet.
Oil	Gnoe	
Orchid		Woekoe.
Pig	Babi	Bab.
Pillow		Loeloeni.
Poison		Elaän.
Post	Fler	
Rain; it rains	Doöt	Doöt; doöt oefiriroe.
Rat	Karoe	Manhowan.
Red	Voelvoeli	Noevoeli.
Remember; remember well	Oefang nangken	Ninana; masilolin.
Resin		Natal.
Rice	Kokat	Wanan.
River	Hoat	Noar.
Road	Oed	
Root	Waär	
Sagueir	Toeat	Toeak.
„ Bamboo for holding		Ravivit.
Salt	Masin	Sierak.
Sand	Gnwoer	Gnoeoer.
Say; what do you say?		Onnalaka.
Sea	Laut	Meti, tahat, haletan.
See	Mlik	Misilik.
Sell	Oemfed	Fedi.
Send		Nigaän ngnoe.
Sew	Mhoar	
Shell		Mahan.
Shell, great clam		Mahan.
Shield	Lèr	Salawakoen (long), Gnelia (short).
Silver	Rubi	Mas ninoer.
Sirie; basket for sirie	Maneran	Naän, loevoe.
Skin	Ulid	
Sky		Lanit.

Vocabulary.	Ke Islands.	Timor-laut (*Larat*).
Sleep	Tatoeb	Toeba.
Sleeping mat		Clari bangkoko.
Small		Koko.
Smoke	Yafmahum	Yafoeman.
Snake	Rubai	Nifa.
Son		Yana ma brana.
Sour	Kahir	Kabi.
South	Tranan	Trana.
Speak	Tangriki	Tangrichi.
Spear	Nangah	Boenoet.
Spoon		Oeroe.
Star	Nar	Narra.
Suckle		Toi masoesoe.
Sugar-cane		Tevoe.
Sun		Lera.
Sweet	Kasloeir	Minaminat.
Tattooing		Belbela.
Teeth		Nifat.
There (to)		Tatin-heri.
Thread, thread of which native sarongs are made	Kar	Avat, alöän.
Thumb		Limad, ketch.
Thunder	Nafdud	Dodong.
Ties, made of sugar-palm		Eira.
Toe, great		Eäd tanan keteh.
Toe, second; little toe		Eäd tanan, froean kewaren.
Toe-nail		Eäd oeoen.
Toe-ring		Sitanea.
To-day		Lerwawa.
To-morrow	Meran	Vera vera.
Tongue		Eard.
Trousers		Kada.
Understand	Okar	Fanowak.
Very; very beautiful		Roäk; lolin roäk.
Wash	Boerik	? Wangir.
Wash, hands		Tiflaroe trame.
Water	Wehr	Oeer.
Waves, large, waves	Roe-roeat	Saksahan, lalawa.
Wax	Lilin	
Weep	Mroon	Fakar.
West		Warat molalan.
White	Nangear	Nangear.
Wife	Hoöd	
Wind	Nioet	Neët, lar.
Window		Yanella.
Wing	Halaän	Halaän.
Wire	Bilbal	Ververi.
Wish	Rangen	Inan roh.
Woman	Vat-vat	Vata.
Wood	Ai	Saüa.
Work		Toetwafa.
Yellow	Toemtoem	

Discussion.

Mr. Thiselton Dyer sent the following communication in explanation of the origin of the preceding report.

In a letter addressed to Sir Joseph Hooker, in 1880, Mr. H. O. Forbes wrote from Sumatra offering, if some assistance could be forwarded him, to attempt an expedition to Timor-laut for the purpose of investigating its natural history—"an object," as the writer stated, "the accomplishment of which is desired both by botanists and zoologists."

Application was made to the British Association for aid in the furtherance of Mr. Forbes's plans. A committee was appointed in 1880, which was reappointed in 1881 and 1882, and grants, amounting in the aggregate to 150*l.*, were placed at its disposal.

After delays arising from various causes Mr. Forbes, accompanied by his wife, eventually succeeded in reaching Timor-laut in July, 1882, and remained there till the following October. A portion of his collection, consisting of a selection of the birds, has already reached England, and an account of them (including seventeen new species) was laid before the Zoological Society, on February 20th, by Mr. Sclater.

Mr. Forbes also furnished the Committee with a detailed report of the circumstances of his residence in the Tenimber group. As this report was principally occupied with an interesting account of the natives of the islands and their habits, the Committee of the British Association was of opinion that this was of sufficient importance to merit being communicated to the Anthropological Institute. Under their instructions Mr. Thiselton Dyer, as Secretary to the Committee, placed it in the hand of Mr. John Evans, for the purpose of submitting it to the Institute.

The President stated that the results of a cursory examination of the twelve crania which Mr. Forbes had collected were, that eight were brachycephalic, and of decidedly Malay type; one was dolichocephalic, prognathous and with large teeth, indicating Papuan or Melanesian affinities; and the other three were more or less intermediate. This is what might have been expected on the border-land of two distinct races; but the great preponderance of the first named was very marked. Nearly all showed signs of artifical flattening of the occipital region. He hoped at a future time to give a fuller account of the characters of this interesting collection.

Mr. Keane remarked that Mr. Forbes's experiences in Timor-laut went far to confirm the views now generally entertained regarding the extremely complex nature of the ethnical relations throughout the whole of Malaysia and Polynesia. Even in this somewhat secluded island the same conflicting elements seemed to be present as in the surrounding insular groups. From Mr. Forbes's careful observations, supplemented by Professor Flower's remarks on the

skulls now exhibited, it must be evident that Papuan, Malayan, and even Polynesian tribes had here become intermingled in diverse proportions, the result being a distinctly mixed race, such as was elsewhere in this region often designated by the inconvenient term "Alfuro." Timor-laut, however, seemed to present the peculiarity that the various elements had not here become so completely amalgamated as in most of the neighbouring islands. Hence the remarkable phenomenon of frizzly and lank hair, brown and black complexion, very tall and very short stature, dolichocephalous and brachycephalous heads, &c., all still found side by side in the same village community. The resemblance in so many of the crania to those of the brown Polynesian race of Samoa, Tahiti, Hawaii, &c., was very striking, and in this connection it was noteworthy that Timor-laut must have been one of the last islands occupied by this race in Malaysia during its eastward migration to the remote archipelagos of the Pacific. It was easy to suppose that some members of the family may have been left behind, and these mingling with subsequent arrivals from Papuasia and Malaysia may have thus contributed to the present heterogeneous ethnical relations of Timor-laut.

Mr. JOHN EVANS made a few remarks upon the paper, and the objects exhibited in illustration of it; among other matters calling attention to the resemblance between some of the habits described—such as the sacrifice of a pig on solemn occasions—and those of the more civilised occupants of the shores of the Mediterranean in early times.

Dr. OPPERT desired information as to the language of the natives.

Mr. CARMICHAEL wished to ask whether the author had sent any explanation of the nature of the ownership of land in Timor-laut—whether, *i.e.*, the expression, used by Mr. Forbes, "Village Community," was to be taken in its strict sense, or whether there was any definite statement showing the ownership to be resident in the Village Community, if such really existed, or the House Community, or in the tribe or the family, or, lastly, whether there was any trace of individual ownership. Mr. Carmichael also inquired whether Mr. Forbes had described the Religion of the inhabitants.

Mr. RUDLER explained that Mr. Forbes, as a naturalist, had probably paid more attention to observations on the physical characteristics of the people than to such questions as those raised by Mr. Carmichael, and he pointed out the difficulty which a person resident for only a short time in the country, and with an imperfect command of the language, would inevitably experience in any inquiry into the religion of an uncivilised people. A vocabulary of words collected by Mr. Forbes accompanied the report.

On the CLASSIFICATION *of* LANGUAGES *in conformity with* ETHNOLOGY.—By GUSTAV OPPERT, Ph.D., Professor of Sanskrit in Madras.

THE science of language is a physical science, and its proper place is in the natural history of mankind. Articulate language is a gift which a benign Providence has vouchsafed specially to man. As articulate speech is a speciality of man, and men, though differing from one another in external appearance and internal attributes, are as a species *one*, and further, as speech is common to all human individuals, unless they are deprived of it by some cause or other, it follows that every person is able to speak, up to a certain degree, every language. The language of the individual is the product of various elements; of the family in which he is brought up—modified, moreover, by the natural influences of the locality and the climate in which he lives. As a separate individual, every man is, besides, endowed with an intellect of his own which will occasionally appear on the surface. We distinguish clearly two very different influential elements which produce and define the speech of the individual; the one, influencing the utterance of sound, is *physiological;* the other, representing the manner of thinking, is *psychological.*

As a rule, an original language springs up in the infancy of national life, expressing the peculiar mental disposition of the community who used it, and retaining the impression which constitutes its individuality. Everybody possesses the latent capacity of speaking, as has been said before, every language; the descent of the individual need not, therefore, necessarily coincide with, or become apparent from, the idiom he uses.

Yet it may be possible that linguists, well acquainted with the peculiarities and intricacies of the dialects they have particularly paid attention to, will discover in the expressions of those who use languages foreign to them by practice or descent, eccentricities which can only be sufficiently explained by their inborn individuality. In order not to be misled into wrong conclusions, one must, in questions of language and race, take into consideration, if possible, the original and not the adopted language; and that, too, in a form the least corrupted and mixed with modern and foreign elements.

We must, moreover, not lose sight of the fact that a person who learns a foreign language, and who does so voluntarily or compulsorily, either for temporary or for permanent use, submits himself to the rule of that language. He tries to speak it, to think in it according to its proper mode, *i.e.*, he assumes its pronunciation, grammar and syntax; he loses, indeed, to a certain

degree, his personal independence, while he accommodates himself to the whims and caprices of his new mistress. The real point at issue is, therefore, not whether the language one speaks indicates the race to which one belongs—as long as that race has been preserved in its purity—which it surely does not; but whether a language, if used by foreign individuals and nations, retains its original character. There is no doubt of it. A language preserves, as it were instinctively, its peculiar construction, and if it does not always coincide, either with the particular nation or person who speaks it, it certainly indicates the race of those who spoke it first, and this, in spite of all apparent change, and it retains the mode of thought of those among whom it first sprung up as their natural means of communication, though that race itself might exist no longer.

Languages exhibit, like the persons who speak them, the different phases of life, with its commencement and development, its decay and death.

The relationship of parentage and offspring among living creatures is also found among languages. A language can be many times propagated or regenerated, but it dies as soon as its daughter-languages establish themselves independently, or it ceases to supply a real want. In nature and construction similar, often even identical, yet a mother-language differs from its daughter-language as a mother from her daughter.

A language can adopt and create as many words as it pleases without changing its character, but it cannot alter its grammar, its syntax, without becoming another; for grammar represents the inmost mode of thought over which the individual person or nation has no real control.

This very fact proves that the original language of a people indicates its race, and *vice versâ*. Comparative philology and ethnology, therefore, are allied sciences which supplement each other. No system of comparative philology is true unless it fulfils this condition; but no linguistic classification can be elaborated unless the expressions which define the family and social life are taken into account.

Ethnological research is deficient if it takes alone into account the outward appearance of men, as philological conclusions cannot only be based on external characteristics as has been done hitherto.

The object and aim of speech is communication, which certainly varies, in point of clearness and perfection, according to the physical and intellectual state of the individual. The ruder the speaker, the cruder the speech. Thus it is not only possible, but even highly probable, that the original enunciations of a language are interjections.

If interjections are, according to their nature, as a rule short and monosyllabic, the original roots of words should be also monosyllabic. "Interjections are," as Professor Max Müller observes, "only the outskirts of real language; language begins where interjections end." But these outskirts are already within the bounds of language, and form the lines of its natural frontier.

Interjections, or whatever name we may give to the main essence of words, precede the other forms of speech; nay, they are most likely the very nucleus from which the latter are formed. A word embodies, as it were, an idea, whether this refers to a concrete object or to an abstract thought. Originally the incoherently uttered word comprised within itself the different variations in meaning as represented later by the different forms of speech. This concentration of the various shapes which mental or material essences may assume in one unchangeable body, their crystallisation in one single form, is most strikingly exhibited in the so-called monosyllabic languages, where each word represents to some extent a mere atom.

Monosyllabism is thus considered by many to be original to all languages, though only a few retained it in their later development. The monosyllabic tendency which prevails in some languages is certainly a most interesting feature, productive, moreover, where consistently adhered to, of other strange peculiarities, *e.g.*, of a singular mode of pronunciation, intonation, and accentuation; but as the various monosyllabic dialects in different parts of the globe, in Asia, Africa, and America, though agreeing in their outward monosyllabic phenomenon, yet disagree in their internal construction by differently expressing thoughts and ideas, monosyllabism by itself cannot well be raised to a standard of classification, as it is peculiar to many idioms, which are dissimilar in other respects.

No doubt the assumption is widely spread, and possesses great semblance of truth, that the characteristic mark of the so-called Semitic languages lies in the dissyllabic formation of their roots; but whether this is really a fact remains to be proved. The majority of Semitic roots display a dissyllabic form, but many of the most important words in Semitic dialects are monosyllabic, and it is not beyond the range of possibility that the dissyllabic or triliteral and quadriliteral roots are based on and derived from monosyllabic roots.

Even when upholding the principle that every dialect has a monosyllabic beginning, one must not lose sight of the fact that this principle is affected as soon as single ideas are combined. However loosely thoughts are linked together, this juxtaposition must influence them. But this composite idea is still main-

tained in monosyllabic languages by separate and unmodified symbols.

To the morphological classification monosyllabism represents the first stage, the radical or isolating; the two remaining are the terminational or agglutinative, and the inflectional or amalgamating. There is no doubt that the system expounded in this morphological classification is equally feasible, and at first sight convincing. But, on the other hand, can we anywhere, in any dead or living language, point out such a gradual change? Or, in case that languages exist where such changes are still occurring, can such a classification be accepted as final? Or can it be regarded as a sufficient classification, when it contains under each division languages which are totally dissimilar? Every language must, in the course of its development, pass through certain phases of growth, but only within the sphere of its peculiar system does it get to maturity. Moreover, the peculiar principle which guides the external development of a language—whether it be monosyllabic, incorporative, euphonic, alliteral, agglutinative, or inflectional—is not a safe criterion by which to measure the mental capabilities of those who speak such dialects. The real test of a language consists in its being able to express lucidly, and to communicate distinctly, all the various modulations of ideas which occur to the speaker.

The capabilities of men lie within certain well-defined limits, beyond which there is no progress. This fact applies also to the languages they speak, and, however gradual this development from infancy to maturity may be, our present knowledge does not enable us to describe step by step the stages passed through. Individual capacity and incapacity are left to their own devices on their way onward, and though the duller man may progress slowly and halt midway towards the final aim reached by the more gifted competitor, both may not pursue the same direction, and where the former prefers a roundabout road, the latter may choose a short cut.

To observe and to mark the external peculiarities and diversities occurring in languages is no doubt of very considerable importance, because, without a minute knowledge of the details, a proper insight into the total cannot be obtained; but such a proceeding ought to be supplemented by an investigation into the causes which produced those peculiarities. The internal process of weaving thoughts influences the external form of speech, and if these two actions, which originate from different parts of the human brain, are well studied, the results derived from their investigation, when joined together, will constitute the true basis of a science of language. The external form of articulate speech is represented by sound, and we call it *vocal;*

the internal we call *mental*. The investigation of the latter is very difficult, as we can only examine it by the sounds, to which it assigns meanings, but which sounds by themselves are meaningless.

It is in the home that language becomes an actual necessity. A man who lives by himself, apart from human beings, does not require speech. But when once the system of companionship of a family is introduced, circumstances are changed.

Judging from probabilities we may conclude that man and wife, especially in primeval times, belonged to one and the same race, though that race may possibly have been split up into numerous, generally even hostile clans. It does not matter for our purpose what sort of domestic life is prevailing, whether it is founded on polyandry, polygamy, monogamy; the difference in the forms of marriage does not affect the construction of the words denoting the nearest degrees of consanguinity. The first material change in a young household is the birth of a child, and those who were previously living together as man and wife become respectively father and mother. It is the child which confers on its parents the dignity of fatherhood and motherhood, and the words for father and mother are, in the great majority of languages, identical with the first sounds a child pronounces, and these sounds, if once permanently applied to signify father and mother, form afterwards the roots for words which convey the chief qualities supposed to be found in parents when regarded from a filial point of view. It is thus not surprising that, *e.g.*, the Sanskrit roots *pā* and *mā* convey the meaning of feeling or protecting, and of making or measuring, as they appropriately express the qualities expected to be found in a father (*pitri*) and a mother (*mātri*).

Comparing, as far as we are able to do, the words denoting kinship with each other, as they occur in the several languages, one most peculiar feature will immediately become apparent. The manner of naming is twofold. The one shows a tendency to observe a certain most prominent quality in a person or in an object, and to name its possessor accordingly; the other deals with the individual specimen as a concrete body, distinguishable from a similar one by a constitutional difference, such as sex &c., which discriminating mark is separately added or peculiarly expressed. This distinction, in order to be recognised as really existing, must show itself throughout the system, at all events in the nearest and most important degrees of affinity. The character possessed by parents must, to some extent, reappear in their children; the same peculiarity which guides the mind of parents when naming their children must manifest itself in their children when they address each other as brothers or sisters.

The languages in which parents call their children sons or daughters, and in which those sons and daughters call each other brothers and sisters, are different in thought—that is, in expression and construction—from those where the former are known by the name of male children and female children, and the latter by that of elder or younger brother and sister. The difference between those two modes of expression is that the one manifests a power of abstraction, which is wanting in the other, as it adheres to the concrete substance. The inclination towards abstractness and concreteness would not be so significant and deserving of notice if it did not show itself in other forms again and again in various expressions of a language, corroborating the tendency observed in the denomination of relations. The custom which prevails among many tribes of using terms of kinship instead of proper nouns as modes of address among relatives enhances the importance of such words. From this concrete mode of address, by means of the words of relationship, to the practice of using an abstract and now more common form of address, represented by the pronoun, is a wide step; but these terms of consanguinity and the pronouns retain a certain affinity and connection between each other, which manifests itself in the manner in which both ignore or express gender.

According to the mental propensity towards concreteness and abstractness possessed by the various human races, and exhibited by them in their languages, I propose to divide the latter into two classes—into concrete and abstract languages. Both divisions are in their turn re-arranged into groups. Into these groups are then classed the various languages, conformably to the differences they exhibit in their external or vocal appearance, whether it be incorporative as the American, alliteral as the African, monosyllabic, agglutinative, or inflectional.

As abstraction is the result of deduction from the concrete, it is, in consequence, posterior in time to it. It pre-supposes a deductive analytic faculty, which is not common to all. The capability of passing from concreteness to abstractness is the touchstone of languages, as it manifests the progress in the capacity of thinking, which goes on in the human brain.

While concrete dialects are thus originally without names for abstract qualities, abstract languages retain the ability to use concrete expressions, though perhaps in a lower degree. It may appear astonishing, but it is not the less true, that a language, unless it undergoes a radical change by which its nature is totally altered and a new dialect created, does not change the characteristic inclination which it manifests in the expression of the different degrees of consanguinity, though the terms themselves may be changed and modified repeatedly; for the terms

are represented only by sounds, which sounds *per se* are without any significance.

The terms *duhitri* and *bhrātri*, daughter and brother, were not, we may be sure, the words first used to denote the relationship of daughter and brother among the people whose language developed itself into Sanskrit; but they are at all events the representatives of previous abstract terms. Abstract languages are able to form, and form indeed at times, concrete terms; but the presence of original abstract expressions decides the question.

In all abstract and in nearly all concrete languages the words signifying father and mother can be traced to the simple and unconscious exclamations of children, whatever they may be. The words distinguishing between father and mother once settled, the child learns, gradually, whether it has to call its father or mother *pa* or *ma*, *ata* or *ana*, &c., &c. But this is not the only mode of naming. A child, especially if it has been brought into closer contact with one of its parents (this will be, as a rule, its mother), regards this parent as *the* parent, and gives to that parent a peculiar name. When it has afterwards become aware of the existence of two parents it preserves the original term, which loses its primitive application to a certain individual, and being taught to affix to it the words denoting male or female, distinguishes between the male parent, or father, and the female parent, or mother. This nomenclature prevails, *e.g.*, among the Nancowry Islanders, as well as among the Hawaians and other kindred tribes.

Through modulation of voice, which effects a change in the sound of the letter, a word may assume a different meaning. Thus altered in pronunciation and sense it becomes in course of time a separate term, and the former identity of the two words is forgotten.

The division of letters into hard and soft, or into close and open, and the application of this principle to speech, is the foundation of the euphonic system met with among such distant tribes as the Tungusians of Asia, the Negroes of Africa, and the Redskins of America. It is among Asiatic and American dialects that the diversity of sound is often employed to express the difference between male and female sex, instead of describing it by using the adjectives "male" or "female." The softer voice being peculiar to women, the softer sound, or what was considered to be so, was chosen to denote the female sex, and the harder tone was applied to designate male individuals, *e.g.*, in the Mandchu language *Chacha* signifies "man," *Checke* "woman," *Ama* "father," *Eme* "mother," *Ahun* "elder brother," *Eiun* "elder sister."

The most important difference existing between children is

offered undoubtedly by sex. Concrete languages do systematically exclude gender; they do not—a very few instances excepted—possess equivalent terms for such abstract words as "boy" or "son," "girl" or "daughter," but preferring as their starting-point the genderless or neutral expression "child," join to it the sexual determinatives "male" or "female." Occasionally even the word "child" is omitted, and the terms "male" or "female" are deemed sufficient to denote son or daughter; *e.g.*, in the Yoruba, Hawaian, Karen, and Telugu languages, "child" is respectively expressed by *Oma, Kaiki, Pho,* and *Biḍḍa;* "male" by *kuri, kana, khwa,* and *moga*; and "female" by *bere, vahina, mu,* and *āda.* A boy is, therefore, respectively called *Oma kuri, Kaiki kana, Pho khwa,* and *Moga biḍḍa;* and a girl *Oma bere, Kaiki vahina, Pho mu,* and *Ada biḍḍa.*

When contrasting this mode of expression with that adopted by abstract dialects, we directly perceive that the words chosen for "boy" and "son," "girl" and "daughter," indicate certain qualities usually ascribed to children. We may remark here, that we do not contend that concrete expressions of relationship were never used in abstract languages; but we say that if they were used they were dropped at a very early stage, so that hardly any traces of them can now be found in any abstract language. In the Semitic languages we meet with words signifying "son" and "daughter," but no *bonâ-fide* equivalent for "child." From this fact we can infer that a third or neuter gender does not exist in the Semitic group of languages. Its presence among the Aryan branch is evidence of the existence of a neuter term for "child."

The word "child" is a strictly concrete expression, designating the young, the offspring of man, and must not be regarded as indicating a child *in abstracto,* for all human children belong to the same species of man. It must not be classed in the same category as, *e.g.*, the word "animal," which can be taken as an abstract formation; and there exist, indeed, tribes who have bestowed a name on all the animals they know, but who have never thought to use a word for animal.

While parentage and filiation admit only two essential component parts, kinship and sex, the relationship between brothers and sisters includes, besides a third element, that of age.

The non-existence of words equivalent to brother and sister in a language must be, to those who converse in abstract tongues, and who are accustomed to them from their earliest childhood, a very striking phenomenon; but an examination into this subject will soon disclose the fact that the absence of such terms is the rule, and their presence the exception. All concrete

languages can possess a general expression of consanguinity irrespective of sex and age; *e.g.*, in the Khasi dialect *Para* denotes consanguinity pure and simple, but to distinguish between brother and sister, the words for "male" and "female," *shinrang* and *kynthai*, must be added, and *Para shinrang* stands for "brother," *Para kynthai* for "sister."

Children who live together under their parents' protection differ from each other principally in sex and age. The distinction of sex is the more important of the two. It separates the children into two classes. Subdivisions are then effected by age. The distinction between seniors and juniors is acknowledged. The eldest, or senior, is the head of the family. The senior has only juniors beneath himself, and the youngest junior only seniors above him. The senior brother and sister being considered the more important and influential members of the family, and of society at large, the terms which express seniority are preserved more carefully than those which are assigned to juniors. The amalgamation of age with the expressions of consanguinity is fatal to the adoption of abstract terms equivalent to brother and sister. The irresistible influence which time exercises on everything prejudices the application of terms which include age in their definition.

Even the genderless terms of consanguinity just mentioned cannot be considered to express fully the abstract sense of consanguinity. For a stricter examination will disclose the fact that they do not describe the affinity of brother and sister in the sense in which it is generally used, as children of the same father and mother, but that they are only applicable to children of the same mother. The Mandengo, Turkish, and Dravidian terms prove this distinctly; they denote a male or female who is born from the same mother—expressions synonymous with the Sanskrit *Sahodara* (Sodara) and *Sagarbha*.

A strangely intricate system of nomenclature arises in many concrete languages from the separation of children according to sex. The relationship existing between brothers and brothers on the one, and sisters and sisters on the other side, is the same. An elder brother is exactly in the same manner related to his younger brother as an elder sister is to her younger sister, and *vice versâ*. The identical genderless terms of consanguinity apply, therefore, to elder brothers and sisters, as well as to younger brothers and sisters. The expression becomes complete when the several determinatives, male or female, have been added. In some languages, as we have already observed, the sound of the word is modulated, in order to convey the necessary distinction. In the Yoruba language "elder consanguinity" is expressed by *egmo*, and "younger consanguinity" by *aburo*; "male" is *okuri*,

and "female" *obiri; egmo okuri* is therefore "elder brother," *egmo obiri* "elder sister," *aburo okiri* "younger brother," and *aburo obiri* "younger sister."

So long as persons of the same sex address each other no difficulty arises, but immediately an individual oversteps this sexual barrier, *e.g.*, a brother speaks to his sister, the case is altered. The principle followed in this proceeding shows that persons of the same sex, when addressing each other, use identical expressions, but that heterogeneous persons use, in this case, dissimilar words. A Hawaian man, *e.g.*, calls his elder brother *Kai kua ana*, his elder sister *Kai ku vahina*, his younger brother *Kai kaina*, and his younger sister *Kai kai vahina*; but a Hawaian woman calls the same persons respectively *Kai ku na na*, *Kai ku a ana*, *Kai ku nānā*, and *Kai kai na*.

This difference in the speech of men and women, however significant, is by natural causes limited within a narrow compass. If men and women really spoke different languages, the very aim for which speech exists, clear communication of ideas, would be frustrated. The circumstance that in Sanskrit dramas men speak Sanskrit, and women Prākrit, is not to the point. The so-called language of the Kaffir women, which is known as the *Uku Hlonipa*, has a totally different origin, and supplies a special want, but it is altogether at variance with the above-mentioned expressions used in certain languages by men or women, when speaking to each other. The *Uku Hlonipa* arises from the repugnance which Kaffir women have to mention the name of their fathers or fathers-in-law, or any word which resembles such names. In its tendency it reminds one of the custom of *tabu*, prevalent among the South Sea Islanders, though the anxious avoidance of the names of the king and of members of the reigning family, and of all words resembling them, is not confined to one sex, but shared by men and women alike.

The terms of kinship hitherto considered excluded sex, but there exist some concrete languages which include it. These latter formations indicate undoubtedly a progress. If sex alone, besides relationship, were expressed, such words would have assumed an abstract appearance. The circumstance of their still retaining age proclaims their concrete nature.

Rank and position are closely connected with, and inseparable from, seniority. The eldest brother is, in the absence of another elder member of the family, *eo ipso* its head. The eldest sister enjoys a similar distinguished position, especially where the laws of inheritance favour the female line. The precedence granted to seniors lowers the position of juniors. Even language does not treat both with the same regard. While distinct terms are

conceded to the elders, the juniors of both sexes have either only one name in common, or when they enjoy the privilege of having special terms assigned to them, these terms themselves bear often the impression of a later origin. Thus, the Tamil word for "younger brother," *Tambi*, is composed of the possessive pronoun *tam*, and the adjective *pin*, "after," and stands for *pin pirandavan*, "he that is born afterwards." Separate terms for "elder brother" and "elder sister," together with common ones for "younger brother" and "younger sister," occur in many Asiatic, American, and Australian dialects.

Four distinct terms for these four classes of kinship, *i.e.*, one special for each, are found in the languages of the Chinese, Turks, Dravidians, Hungarians, &c.; *e.g.*, in Chinese "elder brother" is *heung;* "elder sister," *tsze;* "younger brother," *te;* "younger sister," *mei.* In Chagatai the same are *Aga, baxy, iny,* and *singil;* in Telugu, *anna, akka, tammuḍu,* and *cellelu;* and in Hungarian, *ba* (bacy), *nene, ocs,* and *hug.*

To express in such a language the relationship of "brother" and "sister," both terms must be joined; *e.g.*, in Chinese, "brother" is *heung-te,* and "sister" *tsze-mei;* and in Telugu, *anna-tammuḍu* is "brother," and *akka-cellelu* "sister."

We therefore distinguish between two different kinds of concrete languages. The first contains special words used in case persons of different sex address each other; the second does not possess such peculiar terms, and males and females use, when conversing with each other, the same words as if they were speaking with persons belonging to their own sex. We call the first division *heterologous,* because heterogeneous persons use different words, or speech; and the second *homologous,* because they use, in this case, the same words or speech.

Each division is again subdivided into three classes, as follows:—(1) the first class marks the difference existing between elder and younger consanguinity by adopting special terms for each, and the difference of sex by adding either the words "male" and "female," or by modulation of sound; (2) the second possesses special terms for elder brother and elder sister, but one in common for younger brother and younger sister; (3) the third has four distinct terms for each of these varieties of kinship.

These are the principal varieties in which concrete languages express the relationship between brothers and sisters. They represent approximately the different stages of development of thought which can be observed in the growth of the respective languages. The principle of concretion remains everywhere intact and distinct, but it appears in various phases of refinement, corresponding to the mental capabilities of men. How

this progress originates, how it grows, and where and why it stops, are questions difficult or impossible to be answered.

Having thus laid stress upon the important position which terms of kinship occupy in a language, it must be further proved that their construction is a manifestation of the general character of a dialect, and that the innate inclination re-appears again in different forms of speech.

Next to the words of relationship, the pronouns, as the substitutes of nouns, have preserved most distinctly the original germs of a dialect. In some languages the terms of kinship are retained in conversation, where others would use in their stead pronouns. The fact is one of the many indications which show that both nouns and pronouns are constituted alike in many respects. The connection existing between both manifests itself in various ways. The words for "father" and "mother" differ in the Zulu language according to the pronoun with which they are associated. West Australian languages combine also in a peculiar manner pronouns with terms of kinship and of relationship. In the American languages the terms of relationship, the names of the various members and organs of the body, and other objects which have a personal bearing, are always connected with pronouns.

The employment of real abstract pronouns testifies to a high development, and their existence must be considered as marking an essential progress in the mental life of a language.

The pronouns of the first and second persons have as their starting-point a firm concrete basis; it is either the *I* who speaks, or the *thou* who is addressed. Words which express the respective position of the two first pronouns are therefore used in preference to others. Reverential terms towards superiors equal terms towards equals, and condescending terms towards inferiors, are the natural outcome of such a system. The Javanese dialect possesses thus twenty pronouns of the first and twelve of the second person.

The pronoun of the third person is a truer reflection of the character of a dialect, than either that of the first or the second person. The pronoun of the third person is an artificial *alter ego*. It originates from an inmost tendency towards abstractness. Where such an inclination is wanting it does not exist as in the Javanese.

As in concrete languages there do not exist any abstract terms for brother and sister, so also do they not possess an abstract term for the pronoun *we*, which is found in the abstract languages. The concrete languages acknowledge the differences in the pronoun *we*, by special expressions. Strictly speaking there are two separate kinds of "we." It either includes the

speaker and the party addressed, or excludes the party addressed and includes that spoken of. "We two" is either "Thou and I" or "He and I"; the plural "we" signifies in the same manner "You and I" and "They and I." Every language which contains such inclusive and exclusive terms of "we" indicates by their presence its concrete tendency. The Hottentot idioms are rich in such distinctions; this fact is a sure sign of the Hottentot dialects belonging to the concrete and not to the abstract class, which includes Egyptian and Hebrew. These peculiar pronominal expressions are found to this day in Asia in the Mandchu, Bahing, Gujarati, and the Dravidian languages; in Africa in the Hottentot dialect, and in the neighbouring Madagassy; it occurs in the Malayan and Polynesian tongues, and is a well-known expression in the American languages.

The concrete character of a language can be recognised in many expressions of daily life. The natural properties displayed by individual persons or objects, the characteristic discrepancies apparent in similar actions or conditions, are keenly grasped and appreciated by the unsophisticated child of nature; but the common bond which links together the kindred members to the parent body is, if not overlooked, at all events not appreciated. The individual overshadows the species. Each single object impresses the mind of the beholder at first with its individuality. If this impression becomes overpowerful the mind can no more distinguish between the kindred and the kind, and this difference is in consequence not expressed in speech. There exist tribes, as has been quoted before, who, while giving a separate name to all the animals they know, do not possess a term for animal; others describe the tails of all animals by special words, yet do not know how to express "tail"; others point out each separate plant or tree by an appropriate name, and are unable to speak in general of a plant or a tree; or they will distinctly define each bird, fish, leaf, or stone, or any other existing thing, but as their abstracting powers are deficient, do not understand how to name a bird or a fish, a leaf or a stone.

The Bisaya dialect does not exhibit any verbs which correspond to the abstract sense of the English "to go," "to open," "to gather," and "to buy," but it produces 33, 27, 42, and 13 special terms, all expressing a particular going, opening, gathering, or buying. In the Tagala language, "to go" is expressed in seventy-five different ways, and "food" is boiled in eleven, while it is eaten in the Bisaya dialect in forty different ways. Like the Burmese, so the American Cherokee delights in manifold modes of washing; while the Mohican and the Burmese descant

on the varieties of cutting. Languages so different as Hawaian and the Dravidian dialects are at a loss how to express the verb "to break."

Such combinations as *to-sav* ("much-little"), as equivalent to quantity, and *chung-king* ("heavy-light"), as equivalent to weight, in Chinese, prove that the formation of *tcze-mei* ("elder and younger sister") for "sister," does not stand alone in Chinese. Many more examples from various languages could be produced if the proof contained in these will admit of any doubt respecting the innate concrete tendency of the individual reappearing in his speech.

The ideas which language expresses are defined by gender, number, space, time, and other qualifying attributes. These attributes are found everywhere, and are everywhere the same. They existed previously to that period when man could testify to their presence by alluding to them in speech. For the individual man belongs himself to a sex; he is one of his species, and lives at a certain place during a limited time. These categories never change; but how does language deal with them? This is the question now before us; our intention, therefore, must be directed to observe how a language deals with gender, how it expresses number, denotes space and time, and all the other modalities connected with the ever-changing variations of mind and matter.

The most striking feature which is impressed on our mind, when we look about and regard the various objects around us, is no doubt the fact that they are either endowed with life or not. We all know that imperfect knowledge may falsely ascribe life to inanimate matter, or ignore life in animate creation; but these mistakes only prove ignorance, while they manifest the inclination to constitute vitality as the principal criterion. It affects our senses with all the strength of a concrete substance: for as such appears life. If the existence of life is once admitted as the characteristic mark of distinction, a further subdivision is attempted by separating animate beings, who are credited with possessing the faculty of reasoning, from those who are supposed to be deprived of it. Man, as the representative of mankind, even to the detriment of woman, generally takes upon himself the arrangement of this vexed question. Where knowledge forsakes him conceit helps him. The complete classification into animates and inanimates, and of the former into rationals and irrationals, is occasionally lost sight of, and its place is taken by distributions which acknowledge either only rationals, irrationals, and inanimates, or which, ignoring any difference between the latter two, distinguish simply between rational and irrational beings.

A closer observation devoted to the creatures around us soon discovers the diversity of sex which pervades the whole creation. The existence of sex is no less a reality than is the presence of life; but if the former is accepted as the starting-point of a methodical system, wherein to arrange living beings, inanimate objects, and abstract ideas, it is soon obliged to have recourse to imagination.

The admission of gender, the grammatical representative of sex, as a standard of classification, is evidence of an imaginative turn of thought. It requires the personification of inanimate beings. Imagination endows them with artificial life, assigning to them a gender, as if they were living creatures.

A language marks the varieties of gender when the words, more especially the nouns, contain in themselves the distinction of sex without expressing it by peculiar terminations, additions, or modifications of sound; *e.g.*, in English "man" and "bull" are masculine, and "woman" and "cow" are feminine, but the external form does not betray their respective gender. Of course every language can express the difference of sex, as sex is a natural fact, and a language is nothing if not descriptive; but if a dialect must have recourse to the expedient of adding such terms as "male" and "female," or others which convey the same meaning, it is clear that such a language has not what has been defined as gender. Though *man* is a male, and *woman* a female by sex, grammatically they may be neither masculine nor feminine; *e.g.*, according to Telugu grammar neither *magaḍu* ("man") nor *eddu* ("ox") is masculine, nor *ālu* ("wife") and *āvu* ("cow") feminine.

The addition of terms like "male" or "female" does not affect the gender of any particular word. It only qualifies the noun, as do all adjectives. The gender of the word "child" remains the same whether it is connected with male or female, small or big, white or black, &c.

All classifications, however well they are conceived, and however logically they are applied, encounter obstacles, when they are consistently practised. This is a natural defect of all systems. In the first division, which constitutes life and reasoning power, as the salient points, these two (life and reasoning power) are not always easily discovered, and the unbiassed recognition of gender, in creatures, objects, and thought, is in the second division also occasionally impeded by flights of imagination, or by want of knowledge. But the most important distinction between the two systems must be considered to be the fact, that the first mentioned is adopted by concrete, the second by abstract languages. This choice is retrospectively a sufficient indication of the prevalent tendency in each classification.

The great majority of languages being concrete, the abstract minority only expresses gender.

The well-known African linguist, the lamented Dr. W. H. T. Bleek, is, so far as my knowledge goes, the first among modern philologists who became aware of the important position which gender occupies in language, and who pointed it out in his excellent essays. Dr. Bleek, being struck with the very interesting but puzzling system of concords occurring in South African languages, says that, "when we inquire into the probable etymologies of the Hottentot derivative suffixes of nouns, not one of them seems to have originally any meaning implying sex."

If we now return to the classification from which we started, we shall see that the South African, the great bulk of the American, and some Asiatic languages acknowledge a classification founded on the difference between animate and inanimate creatures; while some other concrete tongues, as Hungarian and the Dravidian dialects, prefer a division between rationals and irrationals. In the Telugu and Tamil grammars the latter go by the name of majors, or high-caste words, and of minor, or low-caste words.

The great difference which exists between gender-denoting and gender-ignoring languages becomes manifest from the manner in which gender is recognised. In gender-denoting languages gender need not be always distinctly expressed, and yet its presence is felt and pervades the whole grammatical system. Gender-ignoring dialects may, on the contrary, apparently possess special forms expressive of sex and be quite devoid of appreciating gender in a grammatical sense, a possibility to which we have alluded previously.

We distinguish in nature especially two sexes, a male and a female; but as there are objects which cannot be properly ascribed either to the one or to the other class, the existence of a neuter class is sometimes deemed emergent. Abstract languages recognise, consequently, either two or three grammatical genders. The introduction of gender into a language is accompanied both by peculiar advantages and disadvantages. Its superiority lies in its requiring a higher mental discernment, in its appealing to imagination; its defect arises from the difficulties which beset the faculty of judgment. Whether a language admits two, or whether it admits three genders, the difficulty is how to dispose of inanimate objects and abstract thoughts. In the digeneous system they must be enrolled either in the masculine or the feminine class; in the trigeneous system the freaks of imagination interfere with a strictly logical arrangement.

The pronoun of the third person is the most positive evidence

for the character of a language, so far as it concerns the question whether a dialect ignores or denotes gender. In the former case the pronoun does not express gender; in the latter two or three forms are required, according as the idiom recognises two or three distinct genders. The third personal pronoun is *de facto* the abstract representative of the various persons and objects; it describes their principal qualities by imparting to them in gender-denoting languages a certain sex. The superiority of the trigeneous system over the digeneous is not only one in theory but also one in practice.

The mode in which languages express plurality, though not so important a feature as gender in the development of a dialect, still attracts a great deal of interest.

I have discoursed on this subject to a great extent in another place,[1] and though the evidence is interesting, and corroborates the conclusions already obtained, I need not enter now into any further details.

The classification of languages which I propose will be as follows:—According to psychological or mental characteristics all languages are arranged in two great divisions—a concrete and an abstract; both divisions are to be subdivided into two classes—the concrete division into the heterologous and homologous; the abstract into the digeneous and trigeneous. Both the heterologous and homologous classes contain three sub-classes, according to the different modes of expressing consanguinity.

If we represent concrete and abstract languages by *C* and *A* respectively, their classes by *a* and *β*, and the groups by 1, 2, and 3, we obtain the following symbols:—Ca^1, Ca^2, Ca^3; $C\beta^1$, $C\beta^2$, $C\beta^3$; Aa and $A\beta$.

To Ca^1 belong (*a*) such American languages as the Dakota, Salith, and Eskimo dialects; (*b*) the Polynesian languages, as Hawaian, Tahitian, Tongan, Fijian, Maori, Malagasy, &c.; (*c*) many Australian; and (*d*) the Basque languages.

Ca^2 includes some American and Basque languages.

$C\beta^1$ contains the Malayan, many African and Asiatic languages.

$C\beta^2$ is represented by the Mongolian and Tungusian languages.

$C\beta^3$ includes Chinese, Japanese, the Finnish, Turkish, Dravidian, and other languages.

Aa is represented by Old Egyptian, Coptic, the Berber, and the Semitic languages.

$A\beta$ contains the Aryan languages.

[1] A second edition of my work, "On the Classification of Languages," is in preparation.

Physiological (*vocal*) Characteristics.	Ps		
	Con		
	Heterologous (*a*).		
	1.	2.	3.
I. (Monosyllabic) ..	..	..	..
II. (Incorporative) ..	*a*. Many American languages. *b*. Basque languages.	Algonquin	..
III. (Euphonic) ..	..	..	..
IV. (Euphonic inflectional).	..	..	..
V. (Alliteral).. ..	..	..	..
VI. (Agglutinative) ..	*a*. Polynesian. *b*. Australian languages.	Narrinyeri	..
VII. (Agglutinative inflectional).	..	..	..
VIII. (Dissyllabic inflectional).	..	..	..
IX. (Inflectional synthetical).	..	..	..
X. (Inflectional analytical).	..	..	..

Explanation—$C\alpha^1$ II. is the symbol for many American as wel
for the Basque languages.
$C\alpha^1$ VI. is the symbol for Polynesian and many A
tralian languages.
$C\alpha^2$ II. is the symbol for the American Algonq
&c.
$C\alpha^2$ VI. „ „ „ „ Australian Narriny
&c.
$C\beta^1$ I. „ „ „ „ Corean, Transgang
Tibetan.
$C\beta^1$ III. „ „ „ „ Mandengo, Yor
&c.
$C\beta^1$ V. „ „ „ „ Congo, Angola, &c
$C\beta^1$ VI. „ „ „ „ Malayan.
$C\beta^2$ VI. „ „ „ „ Tungusian, Mo
lian, &c.

Psychological (*mental*) Characteristics.

Concrete (*c*).				Abstract (*a*).	
).	Homologous (*β*).			Digeneous (*a*).	Trigeneous (*β*).
3.	1.	2.	3.		
..	*a*. Corean. *b*. Transgangetic. *c*. Kiranti. *d*. Tibetan.	..	Chinese? ..	Old Egyptian.	..
..	..	..	..	..	..
..	Mandengo, Yoruba, &c.	..	..	..	..
..	..	..	..	Haussa ..	..
..	Congo, Angola (Kaffir) &c.	..		..	..
..	Malayan languages.	Tungusian, Mongolian languages.	Japanese, Finnish, Turkish, Ancient Gaudian, Dravidian, &c.	..	..
..	..	..	..	..	Hindustani, Bengali, Singhalese.
..	..	..	..	Semitic languages.	..
..	..	..	..	..	Sanskrit, Zend, Old Greek, Latin, &c.
..	..	..	..	..	Italian, Modern German, English, &c.

rican as well as
and many Aus-
an Algonquin,
ian Narrinyeri,
Transgangetic,
an.
ngo, Yoruba,
Angola, &c.
an.
sian, Mongo-
&c.

Explanation—$C\beta^3$ I. is the symbol for the Chinese.
$C\beta^3$ VI. „ „ „ Japanese, Finnish, Turkish, Dravidian.
Aa I. „ „ „ Old Egyptian.
Aa IV. „ „ „ Haussa.
Aa VIII. „ „ „ Semitic languages.
$A\beta$ VII. „ „ „ Hindustani, Bengali, Singhalese.
$A\beta$ IX. „ „ „ Sanskrit, Zend, Ancient Greek, Latin, &c.
$A\beta$ X. „ „ „ Italian, Modern German, English, &c.

This psychological classification, which is based on the peculiar action of that part of the brain where the thoughts are woven together, must be supplemented by the physiological classification which originates in that part of the brain which produces the sound and which employs the vocal peculiarities as a criterion of arrangement.

I believe it is necessary to enlarge the system of the vocal or external classification. More certain information is required to decide the question of the external development of languages. I restrict myself in mentioning a few prominent, well-known characteristics, in order to illustrate the system proposed here, representing the terms indicative of the psychological construction by Roman figures: thus, monosyllabic languages will be represented by I; incorporative by II; euphonic (North African Negro) by III; euphonic inflectional by IV; alliteral (South African) by V; agglutinative by VI; agglutinative inflectional by VII; dissyllabic inflectional by VIII; inflectional synthetical by IX; inflectional analytical by X.

This scheme is only provisional, as it is by no means complete. Many languages have not been described, but it will be possible, after sufficient information, to assign a proper place to each language. I have collated more than one thousand languages, none of which exhibited any signs contrary to the classification proposed. It is, besides, a memorable fact that though this classification was originally derived from a strictly philological base, it coincides totally with ethnology.

The result at which I hope to have arrived may be briefly summed up as follows:—

In order to assign to a language its proper place in the realm of speech, both its psychological or *mental* and its physiological or *vocal* characteristics must be well studied, combined, and if possible described in a scientific formula.

All languages must, according as the psychological propensity towards specialising and generalising prevails, be divided into two classes, which we have called concrete and abstract. Difference in mental disposition determines difference of origin. We know of no concrete language which can be regarded as related to a primitive abstract language, or to have developed into an abstract idiom, unless through the introduction of a foreign abstract element, which introduction produces an entire change. A transition from concrete to abstract, though possible according to the laws of nature, cannot be actually pointed out, and the distinction may therefore be considered to be a fixed one to all intents and purposes. This assertion does not exclude the fact that one language may be in one subdivision, and another in another subdivision of the same class, and yet both may be

originally related to each other. In like manner there exist different varieties in the same species, and varieties which seem to be a connecting link between two species in the several kingdoms of nature.

The concrete class ignores totally the distinctions founded on gender, while gender is the keystone to the abstract system.

Both classes admit of subdivisions, and in the concrete, as well as in the abstract classes, the peculiar formation of the terms of kinship is provisionally chosen as the principal criterion.

The physiological disposition, as manifested in the external or vocal formation, combined with the material mode of thinking manifested by a language, betrays fully the peculiar character of an idiom, as is exemplified in the scheme of the system of classification.

Discussion.

Mr. Keane commented on the many difficulties presented by Professor Oppert's scheme. The primary aim of all classifications, he conceived, was to group together all individuals assumed to be genetically connected. But according to this plan, languages such as Latin, Italian, and French, known to be so connected, would have to be divorced from each other, and placed in separate groups. Italian and French had recast the Latin gender system, fusing the neuter in the masculine, just as English had altogether revolutionised the original gender principle of the Aryan family. This might reasonably be urged as a strong argument against any classification based on considerations of grammatical gender. It could certainly be no reason for separating English, French, or Italian from the Aryan family, to which they undoubtedly belonged. A method requiring such a severance at once exposed itself to this fatal objection, and instead of order, seemed to introduce nothing but confusion and chaos. It was admitted that grammatical gender was the exclusive prerogative of three linguistic groups, the Aryan, Semitic, and Hamitic, which may have sprung from a common centre, but which, notwithstanding this common principle, had not yet been shown to flow from one primeval stock. How much more hopeless must be the task to class all other languages in one category on the negative ground of the absence of grammatical gender. Abstract and concrete, gender and no gender, rational and irrational, animate and inanimate, inclusive and exclusive pronouns, analysis and synthesis, and the like, could no more afford any solid basis of linguistic classification, than the hunting, pastoral or agricultural states, common anthropomorphic ideas, similarity of stone implements, and the like could afford any solid basis of ethnical classification. All these points of resemblance might fairly be adduced in support of monogenistic views, but could not be relied upon to determine the mutual relations of subsequently evolved

physical and linguistic varieties. The attempt to show any necessary connection between physical and linguistic groups must also be abandoned once for all. Long lists might be drawn up both of peoples who, like the Bulgarians, Hazarahs, Aimaks, Sakalavas, Betsimisaracas, are known to have changed their original speech, and of others who, like the Magyars, Osmanli, Karelian, and other Finns, have through intermixture changed their original type while preserving their original speech. It is also evident that within the same anthropological group, as within the Caucasic, two or more radically distinct linguistic groups have often been developed. It follows, as Professor Sayce has already pointed out, that "philology and ethnology are not convertible terms."[1] In the ethnological Appendix to his "Asia" (p. 695), Mr. Keane had dealt with this problem of specific diversity of speech within the same physical branch of mankind. But it was surprising to find how little attention had hitherto been paid to the subject, a right understanding of which lay nevertheless at the root of so many ethnological difficulties and seeming contradictions. When we once came to see that physical and linguistic evolution proceeded on different, and often on divergent lines, we should cease to wonder at these discrepancies, which, from the very nature of the case, were in fact inevitable. Meantime, in all attempts at linguistic classification Mr. Keane considered that nothing was to be gained by departing from the old lines as laid down by W. Von Humboldt, who had classed all languages in four great orders based upon morphological considerations. But the mistake made by Dr. Oppert, in common with some other recent innovators, seemed to be that he supposed these orders—the isolating, agglutinating, polysynthetic, and inflecting—to be so many family groups, as it were, and of course from this point of view nothing could be easier than to upset the arrangement. No sane philologist, however, for a moment supposed that because two idioms belonged, say, to the agglutinating or to the inflecting order, they must therefore be mutually related. These orders were like the great divisions of the animal and vegetable kingdoms, within each of which were contained many genera and species, not otherwise necessarily related to each other. They were so many phases of upward development, through which all speech tended to pass, just as in zoology we pass in natural stages from the fishes through the reptilia to the avifauna on the one hand, and to the mammalia on the other. But as the linguistic is much more rapid than biological evolution, cases might occur in which languages had passed through two if not more of these orders, even within the historic period. Thus we find that several neo-Teutonic languages, notably English, and most neo-Latin languages, such as Italian and French, have broken away from the inflecting or synthetic state, and have reverted almost to the earlier isolating or analytical condition of speech. It is a mistake, however, to suppose that they have reached a purely analytical state, for the Romance verb, for

[1] "Science and Language," vol. ii, p. 317.

instance, is still largely synthetical—in some cases more so even than Latin itself. Compare, for example, the Italian *parlai*, *parlasti*, *parlò*, with the Latin *loquutus sum*, *loquutus es*, *loquutus est*, and *amatevi* with *amamini*, that is, *amamini estis*, a purely participial and analytical form. But even had they made greater strides towards analysis, these languages could not on that ground be separated from the older and more synthetic Italic and Teutonic prototypes, from which they are historically known to have undoubtedly descended. All this merely goes to show that even the morphology of speech is far less persistent than that of biological species. Hence, within the four morphological orders, which in any case merge imperceptibly one into the other, there may be comprised groups or genera in which the agglutinating, inflecting, and other stages are found overlapping each other at various points. Still the historic evidence of genetic descent can never be set aside, and the Holderness dialect of Yorkshire, for instance, which has scarcely retained half-a-dozen grammatical inflections, is as certainly a member of the Aryan linguistic family as are Sanskrit, Greek, or any other highly inflecting Indo-European tongues. A system of classification which tends to disturb these recognised relations cannot be regarded as satisfactory, and, as already remarked, can ultimately lead to nothing but chaos.

Mr. A. Tylor expressed his admiration of the singularly clear manner in which the author had elucidated a most difficult question. He was especially struck with the remarkable exposition of the mode in which concrete and abstract expressions had arisen. It was most difficult to explain such matters to students, but on Dr. Oppert's plan it became an easy matter. Mr. Tylor was also pleased to find the author using the term *homologous* more in the strict sense of proportion, which it had borne for two thousand years, than was often the case with anatomists.

Dr. Oppert, in reply, remarked that Mr. Keane did not seem to grasp the drift of his classification, even ignoring that he still retained, though in a limited application, such external differences as monosyllabic, agglutinative, inflectional, &c. To his (Dr. Oppert's) surprise Mr. Keane contended that such differences were never used in classifications, the contrary being too well known a fact to need remark. That Mr. Keane did not admit that there existed a difference between mother and daughter languages did not affect the real matter of fact. The objections propounded by Mr. Keane needed no reply, as they did not touch the foundation of his (Dr. Oppert's) classification, though, on the other hand, the author said he should be only too happy to listen to criticisms of his system, which was, he was well aware, as yet, far from perfect.

APRIL 10TH, 1883.

Professor W. H. FLOWER, LL.D., F.R.S., *President, in the Chair.*

The Minutes of the last ordinary meeting were read and confirmed.

The following presents were announced, and thanks voted to the respective donors:—

FOR THE LIBRARY.

From Professor SCHAAFFHAUSEN.—Die Höhlen bei Steeten-an-der-Lahn. By Konservator Oberst z. d. v. Cohausen.

From the AUTHOR.—Der Neue Höhlenfund von Steeten. By Dr. Hermann Schaaffhausen.

From the SOCIETA ITALIANA DI ANTROPOLOGIA.—Archivio per l'Antropologia e la Etnologia.

From the SOCIETA DI SCIENZE NATURALI ED ECONOMICHE DI PALERMO.—Giornale di Scienze Naturali ed Economiche. Vol. XV, 1882.

From the SOCIETA GEOGRAFICA ITALIANA.—Emigrazione Italiana all'Estero nel 1881.

—— Acts du 3e Congrès International de Geographie. Vol. I.

From the ACADEMY.—Verslagen en Mededeelingen der Koninklijke Akademie van Wetenschappen, Afd. Natuurkunde: Tweede Reeks, Deel XVII.

—— Processen-Verbaal van de Gewone Vergaderingen der Koninklijke Akademie van Wetenschappen, Afdeeling Natuurkunde.

—— Jaarboek van de Koninklijke Akademie van Wetenschappen gevestigd te Amsterdam voor 1881.

—— Atti della R. Academia dei Lincei. Vol. VII, Fas. 4.

From the ASSOCIATION.—Proceedings of the Geologists' Association. Vol. VIII, No. 1, and Annual Report.

—— Transactions of the National Association for the Promotion of Social Science, 1882.

From the MUSEUM.—Archivos do Museu Nacional do Rio de Janeiro. Vols. IV, V.

From the SOCIETY.—Journal of the Asiatic Society of Bengal, No. 251.

—— Proceedings of the Royal Society, No. 223.

—— Journal of the Society of Arts. Nos. 1582–1584.

—— Boletim da Sociedade de Geographia de Lisboa. No. 7, 1882.

From the EDITOR.—Journal of Mental Science. April, 1883.

—— "Nature." Nos. 698–700.

—— Revue Politique. Tom. XXXI, Nos. 11–13.

—— Revue Scientifique. Tom. XXXI, Nos. 11–13.

—— Science. Vol. I, No. 1.

—— Timehri. Vol. I, Part 2, December, 1882.

The following paper was then read by the author:—

On the OSTEOLOGY *of the* ANCIENT INHABITANTS *of the* ORKNEY ISLANDS.

By J. G. GARSON, M.D., Anat. Assist., Royal College of Surgeons of England; F.Z.S.; Memb. Anthrop. Inst.

(WITH PLATE I.)

IN the following remarks I propose to direct the attention of the Institute to the osteological characters of those of our ancestors who formerly inhabited the Orkney Islands. Though much has been written on the prehistoric archæology of these islands, the physical anthropology of the early inhabitants is only known from short accounts, chiefly in the writings of Drs. Barnard Davis and Thurnam. The cause of this is, perhaps, not far to seek, since the osteological remains hitherto available for anthropological research have been very limited, though not so much on account of actual want of material as from its being scattered. Concentration of the osteological remains of all races in a few large museums, where such specimens are preserved and made available for scientific research and comparison, is very desirable. Single skulls, in the possession of private individuals or of small museums, are seldom of much use to any one, whereas collected together they are of the greatest use and scientific interest. The presentation of these to the larger anthropological museums is consequently much to be encouraged for the advancement of anthropology, and it is to be earnestly hoped, therefore, that every one who is able to assist us in this way will not lose an opportunity of doing so, especially those who possess well-authenticated skulls or skeletons of any of the ancient inhabitants of this country, or indeed of any race. Donors need not be afraid of their presentations being overlooked among the multitude of other skulls and skeletons in our larger museums, as I have often heard it expressed. It must be remembered that it is to these collections that anthropologists go when in search of information; consequently the specimens are more likely to be seen and used, while the catalogues, which usually not only record the history of the specimens, but also the munificence of the donor, are read and perused by many more who may not have the opportunity of examining the specimens.

The ancient inhabitants of the Orkneys are represented in the museum of the Royal College of Surgeons of England by one skeleton, more or less complete, and five skulls. In the museum of the University of Cambridge there are six skulls; in

the collection of the Society of Antiquaries of Scotland, at Edinburgh, there is one; and in the museum of the Philosophical Institute of Leeds there is another skull. To all of these there are well-recorded histories of the localities in which they were found, and of the objects which surrounded them. Through the kindness of Professor Humphrey, I have had an opportunity of examining the Orkney skulls at Cambridge, as well as those in the College of Surgeons' museum. The single skulls at Edinburgh and Leeds I have not measured, but their chief dimensions are recorded in the "Crania Britannica."

As much information is to be derived from studying the osteological remains in conjunction with the archæology of the places in which they were found, I propose, before describing the specimens, to give a short history of these places, which were either places of abode or burial. Of the former there are the so-called Picts' houses, the most complete example of which is that of Skerrabrae, in Sandwick, which has been described and figured by the late Mr. George Petrie,[1] and was the subject of a second paper, containing the results of more recent excavations, by Dr. William Trail.[2] The buildings consist of a group of central chambers, arranged on both sides of a winding passage, into which they open. The most complete chamber is about 20 feet square. In the centre is the hearth, elevated a little above the floor; partitioned off by means of flagstones, set on edge, are small compartments arranged round the four walls; and on the floor are some stone cists, near one of which was found a very rude clay urn. The walls of the chamber are at present about 6 to 8 feet high. In each wall are openings which lead into small chambers, or cells; through one of these, which communicates by a doorway with the exterior, a drain passes outwards, and the opening seems to have been guarded. The openings into the central passage are two in number, one principal doorway and a second smaller one opening into one of the side chambers, which in turn opens into the central passage. The height of the main passage seems to have been 5 or 6 feet, judging from the portion where the roof is complete, and from 2 to 3 feet wide; at one part it widens out into a triangular corner; it also widens opposite some of the doorways of the chambers. From the fact that the jaw-bones of a large whale were found lying across the floor, one on each side of the hearth, it seems probable that the structure had been roofed. Four chambers, such as described, have been discovered and cleared out, but it seems probable that some others remain unexplored.

[1] "Proc. Soc. of Antiq. of Scot.," vol. vii, Part 1, p. 201 (1869).
[2] *Loc. cit.*, vol. viii, Part 2, p. 462 (1870).

There is some evidence of one of the chambers having been destroyed while the building was inhabited. In these dwelling-places great varieties of stone and bone relics, all of the rudest manufacture, have been found; amongst other things may be mentioned celts, which are rare in Orkney, and stone discs of various sizes; two circular stone balls, about the size of an apple, carved into a series of projecting conical points; bone chisels; pins; beads, at various stages of manufacture; bone cubes, or dice; various pieces of rude pottery, without any ornamentation; and lumps of unbaked clay. There were also found large stone mortars, which contained pounded bones and heaps, amounting to several bushels, lying near them. As indicative of the animals that existed, there were found the bones of sheep, pig, red deer, oxen, several large ox-bones, which Mr. Laing states[1] to be those of *Bos primigenius*, and the small straight bones of *Bos longifrons*; whales' teeth, and other bones, as well as those of dog and fish. Conspicuous by their absence were querns, whorls, the hand-comb, spears and arrows. No trace whatsoever has been found of any metals.

The human remains found in Skerrabrae consist of the skeleton 346A, a skull 346B, and a few other bones. The skeleton was found in the chamber described, near the fireplace, with the head to the north, the knees tucked up, and the arms folded; the head was the lowest part, and was about 3 feet above the floor. There were some other bones higher up in the sand than the body. As to the exact spot where the other skull and bones were found, I have not been able to ascertain; but Mr. Petrie states that "human bones were found in the triangular corner of the passage, along with bones of the ox, &c., and one of them, a femur, had been notched." Again, Mr. Laing mentions that "a fragment of a lower jaw and other human bones were found, with animals' teeth and bones, under the pavement in one of the chambers." The specimens were in the possession of the late Mr. Watt, who chiefly excavated the buildings, till his death, when they were thrown out of his valuable museum, and re-interred. "In the summer of 1879," says Dr. Charles Clouston, jun., by whom the specimens were presented to the College, "when in Orkney, I managed to find where they were, and got leave from the present Mr. Watt to have them dug up again. The place where both interments took place is dry and sandy, which, I suppose, accounts for their preservation." Such is the history of how these remains have been rescued and preserved for scientific investigation. The other skulls in the College of Surgeons' museum were found in stone cists in round barrows

[1] "Proc. Soc of Antiq. of Scot.," vol. vii, Part 1, p. 56.

at Newbigging, Rendall, and Townhill, the first two of which have been fully described by Mr. G. Petrie.[1] The Newbigging cist, which was of a complex nature, measured 4 feet 6 inches long, by 3 feet 1 inch broad, and 2 feet 3 inches deep, and lay east and west. It contained two skeletons. The one of which 162 is the skull lay at the east end, on the right side, with the right hand supporting the right cheek, the left arm and hand lying across the chest; the lower limbs were flexed and drawn up. The second skeleton lay at the other end of the cist on the left side, with the lower extremities flexed, and the femur and leg-bones across those of the first skeleton, which showed that the second had been the last to be placed in the cist. It was, moreover, so huddled together as to indicate its having been buried some time previous to being placed in the cist, or having been dismembered before being deposited. A heap of ashes, on which were some of the bones, was likewise found in the cist. The other bones and the skull fell to pieces on being removed; some fragments of the latter were preserved and sent to Dr. Barnard Davis, who considered it was probably that of a man. There are no remains of this skeleton in existence now. Near the barrow in which these skeletons were found, a clay urn and a skull were accidently discovered some years previously by some workmen, who at once re-interred the skull, but the urn was broken. No trace of the skull could be obtained by Mr. Petrie. The cist at Rendall measured about 5 feet long by 2 feet 3 inches broad and 2 feet 7 to 10 inches deep, and lay nearly north-west and south-east. It contained two skeletons, which Mr. Petrie tells us were remarkably like those he had previously found at Newbigging. At its north-west end was a skeleton which corresponded to No. 1 of the Newbigging cist, lying on the right side, with the right hand apparently placed under the right cheek, and the left arm and hand across the chest. The lower limbs were drawn up and flexed. The skull fell to pieces on being removed. At the other end lay a second skeleton, of which 164 is the skull, in a similar position on the left side; the arms, thigh, and leg-bones lay huddled together across and above the leg-bones of the first skeleton, and altogether it seemed as if it had been dismembered or crushed before interment. The bones were generally wasted, and crumbled down when exposed to the atmosphere; but Mr. Petrie says, "I was able to examine these sufficiently to ascertain that, while the upper part of the frame was broad and massive, the thigh and leg-bones were not of corresponding size." A second cist, measuring 3 feet long, 1 foot 10 inches wide, and 3 feet deep, was found a few feet distant

[1] *Loc. cit.*

from the first, in which was a partially burnt skeleton, of which 165 is the cranium. The Townhill cist, in which skull 163 was found by Mr. Petrie in 1859, is described in the "Thesaurus Craniorum" as a short-flagged cist; but I have not been able to discover its dimensions, or further information regarding it.

Of the other skulls to be described, one was obtained in a cist in the parish of Harray, which measured 2 feet 10 inches long, by 2 feet 6 inches wide, and the same in depth; one from the Burg of Quoyness, in Sanday, regarding which I have not been able to ascertain any further history than the inscription upon it by Dr. Thurnam already given; and six were unearthed from the Knowe of Saverough, of which it will be necessary to give a brief description. This tumulus was opened in 1861 or 1862 by the late Mr. Farrar, M.P., by whom an account of its exploration has been published.[1] It is situated only a few feet above the seashore, and measures roughly 168 feet in diameter, by 14 to 16 feet in height. Its shape is liable to vary, from the shifting of the sand of which it is entirely composed. All the bodies were found in stone cists, which in many instances were broken. These appear to have been constructed on the surface of the ground, and to have been covered over with sand. The heads of the skeletons faced the north-west, except two which were turned to the north. At that time the remains of twelve or thirteen persons were found, and in several instances the skeletons were more or less complete, and in good condition; of these all that I know of are four skulls in the museum at Cambridge, one at Edinburgh, and one at Leeds. What has become of the other parts of the skeletons I am unable to say. That these should not have been as carefully preserved as the skulls is exceedingly unfortunate, as they would have been invaluable, if only for determining the sex of some of the skulls. Beside the skull now in Edinburgh was found an urn of baked clay; except this no relic was found with any of the skeletons, but in a cist by itself was found a bell. I may mention that no trace of the custom of burning the dead, so common in round-barrow cists, was found here. A little distance from the cists, within the tumulus, the remains of an old building were discovered in a very ruined state, which Mr. Farrar recognised to be a "Broch," or burg, another kind of ancient dwelling found in Orkney, which is thought by some authorities to have been contemporary with the "Picts' Houses," but which others consider to belong to a later period. In this burg were found an ancient "comb," some whales' bones, bone pins, querns, and "a deer's-horn handle of some instrument, which retained yet the marks of iron tacks or nails."[2] In 1866

[1] "Gentleman's Magazine" (1862), Part 2, New Series, vol. xiii, p. 601.
[2] *Loc. cit.*

Mr. Farrar further explored the mound, and discovered a well-built wall, enclosing what appeared to have been a flagged court, an oblong stone like a ship's block, a bone pin, fragments of deers' horn, and a portion of a human skull. Outside the wall was the burg midden.

In order to determine, if possible, a little more accurately the history of this burg and the skeletons, we must compare it with other buildings of a similar kind. At Oxtro, which is about a mile from Saverough, some cists, containing urns filled with ashes and burnt bones, were found by Mr. Leask in deep-ploughing and levelling what appeared to be a natural hillock. They were the ordinary cists of the bronze period, and in some instances contained bronze ornaments. Below the cists, which were about 3 feet from the surface of the soil, traces of masonry were found, and on clearing away the rubbish to the foundation a complete circular burg, about 60 feet in diameter, was disclosed. This has now been thoroughly explored, and consists of two massive concentric walls, which in their present condition are about 6 feet in height. The inner wall encloses a large circular central chamber, from which there are doorways leading into smaller chambers, the external sides of which are formed by the outer wall. The cists and bronze articles were confined entirely to the strata above the burg, in which were found only deers' horns, bone and stone relics, &c. At Monkerhouse, near Stromness, Messrs. Laing and Petrie discovered the remains of a burg, about half of which has been carried away by the wasting of the coast-line. On the mound formed by the ruins of the burg an ancient chapel and cemetery have been placed. In digging in the cemetery quantities of bones and teeth have been turned up from the midden of the burg, and a rude hand-comb. In the outskirts of the midden, at about 3 or 4 feet below the present surface, cists between 5 and 6 feet in length are found, containing extended skeletons, the bones of which have been noticed to be very old, and the skulls very thick. The level of these cists corresponds to the foundations of the burg and is distinctly below that of the old chapel and cemetery. From these two burgs we learn important facts bearing upon the history of Saverough. We learn that burgs evidently existed long before the bronze period, since at Oxtro sufficient time had elapsed for the ruins of the burg to become covered over with several feet of soil before the inhabitants of the bronze period buried there. We learn from Monkerhouse that it was the custom, apparently, of the inhabitants of the burg to bury their dead in cists near the burg. This, I think, was very likely practised at Saverough, a conjecture which is strengthened by the relation of the cists to the burg found by Mr. Laing to

exist at Keiss, in Caithness, though it would be very desirable to procure, if possible, some skulls from the burg cists at Monkerhouse, for comparison with those from Saverough. I therefore do not agree with Mr. Farrar in his conjecture that Saverough "may have been used as a place of burial by some of the tribes inhabiting the islands long after it became a ruin." Both the probable history of the burg and the character of some of the human remains appear to me to be against its being a burial-place only of the comparatively recent date Mr. Farrar would lead us to suppose. That the mound has been used as a burial-place at different periods there is clear evidence from some of the skulls obtained from it. I agree, however, with Mr. Farrar as to the bell found in it having been placed there at a comparatively very recent date.

We have now to consider the physical characters, as indicated by the osteological remains before us.

Stature.

The datum we possess is, unfortunately, quite insufficient for establishing any accurate ideas as to the height of the ancient Orcadians. The only indication which I have been able to obtain is from the measurement of the skeleton from Skerrabrae, that of a woman, which, when articulated, measures 1·590 m. in height. This appears, from the most trustworthy results I have been able to obtain, to be about the mean height of the present existing English race of females. Professor Bowditch found that the height of young women between eighteen and nineteen years of age in Boston, U.S.A., was 62 inches = 1·575 m. Quételet gives 1·580 m. as the mean height of 300 Belgian women; while Krause[1] states that he found the average height of well-developed North German women between the ages of twenty and forty years to be 1·620 m. General Pitt Rivers found the average height of seventeen women whom he measured at Flamborough to be 5 feet 4 inches = 1·625 m. Probably, then, if we take 1·600 m. as the mean height of European women, we will be very nearly correct, the variations above and below this figure being exactly equal. The height of the skeleton before us, estimated from the lengths of the lower limbs, agrees very nearly with that of the articulated skeleton. Professor Humphrey has shown that the length of the femur, in proportion to the height of the body, is as 275 to 1,000.[2] The length of the femur being in this skeleton 442 mm., by this proportion the height of the body

[1] Krause, "Handbuch der Anatomie," 3te Aufl. (1879), Bd. ii, S. 9.
[2] Humphrey, "Treatise on the Human Skeleton" (1858), p. 108.

would be 1·607 m. Calculated from the length of the femur and tibia, according to Rolleston's method,[1] the estimated height would be 1·602 m. It is unfortunate that although several skeletons have been found, as we have learned from the histories of the excavations, none of these, or even of the long bones (from which the height could have been fairly accurately ascertained), have been preserved in at least any of our well-known anthropological collections. I may here observe that it is of the utmost importance to secure all the bones that can be got of these ancient inhabitants of Great Britain, whether in the Orkney Islands or elsewhere. The time is soon coming when all their osteological remains will be unprocurable. The history of other races that have become extinct without our having secured an adequate number of their skulls and skeletons, from which to study their osteological characters, should be a lesson to us in respect of those who have once inhabited our own country. Broca has very aptly said, "Pour les races peu connues, à défaut d'un squelette complet, tout fragment de squelette est une acquisition précieuse."[2] All the bones are of importance, I repeat, and would specially impress this upon antiquarians and those who are engaged in carrying on excavations in old barrows and other places where human remains are found. Many valuable skeletons are lost by the bones being very fragile and falling to pieces on being handled. These may, in most instances, be preserved by taking the simple precaution of melting a piece of spermaceti, and painting them over with it while still *in situ*. Should spermaceti not be at hand, a piece of paraffin, or composite candle, melted down and painted over the bones, will answer as well.

The Skull.

When the six skulls which I exhibit are placed on the table side by side, they can readily be separated into two groups, Nos. 346A, 346B, 163, and 165 forming one group, and Nos. 162 and 164 the other. The skulls at Cambridge likewise are divisible into two groups, Nos. 325, 326, 327, and 329 correspond to the first, while Nos. 322 and 330 correspond to the latter group; 323 (which seems to have been lost from the Cambridge collection), the skull at Leeds, and that at Edinburgh, belong, likewise, to this second group. These two groups are distinguished from one another by the skulls belonging to the first being longer antero-posteriorly in proportion to their breadth than those of

[1] Rolleston, "British Barrows" (1877), p. 564.

[2] Broca, "Instructions Générales pour les Recherches Anthropologiques," p. 11 (1865).

the second set, which are rounder in form. The first set are, as we will presently see, dolichocephalic, while the latter are mesaticephalic, or brachycephalic.

Sex.—Of the long or dolichocephalic skulls before us No. 163 can readily be singled out as that of a man, while the other three are those of women, though at first sight some doubt might be entertained as to the sex of 346A; more careful examination of it, as well as of the other bones of the skeleton, show that it belongs undoubtedly to the sex to which I have referred it. The skull, and in some respects the pelvis also, illustrates an observation made by Professor Welcher,[1] and confirmed by Professor Rolleston,[2] that the cases where ambiguity as to sex arises are cases in which female skulls have assumed, or must be supposed to have assumed, male characters. Of the other two round skulls before us, No. 162 is that of a man, and No. 164 that of a woman. This latter, we have found, was considered by Mr. Petrie to be that of a man, and has also been tabulated as such in the "Crania Britannica";[3] but in the "Thesaurus Craniorum" it is described as that of a woman. Without knowing of the discrepancy in the descriptions I classed it as a female. After finding that there had been doubts as to its sex, I placed it before our President, Professor Flower, who independently, and without apparent hesitation, classed it as a female skull. This being the skull of a female, there is reason to believe that the second skeleton in the Newbigging cist was also probably that of a woman, since Mr. Petrie states that its skull and the one before us were exactly alike, and differed from the skulls of the males at the opposite end of each of the cists in being rounder, and the bones of the skeleton shorter and smaller; though against this Dr. Barnard Davis states, very guardedly, however, that the fragments of the second Newbigging skull sent to him showed that "it might probably be that of a man." Though Mr. Petrie was mistaken in regarding the second skeleton in the Rendall cist as that of a man, and, I think by inference, probably also the corresponding one from the Newbigging cist, there is no reason to doubt this very careful and accurate observer when he tells us that the skull of the chief skeleton in the Rendall cist, which fell to pieces, was like the corresponding Newbigging skull, No. 162, that of a man, of exactly the same type. The history of the skeletons found at Rendall and Newbigging is therefore very interesting and suggestive. In both instances we have a man of brachycephalic type interred in the same cist with a woman of the same type,

[1] "Arch. f. Anthropologie," vol. i, p. 127 (1866).
[2] Greenwell and Rolleston, "British Barrows," p. 565 (1877).
[3] Table II, pp. 242, 243, No. LXXXIII.

who had been laid there after him, and who presented an appearance as if her body had been previously dismembered or roughly handled, and in the Newbigging cist partially burnt. We have, also, interred in close proximity to the Rendall skeletons, the partially burnt body of a woman of dolichocephalic type, and the record of another skull having been found in proximity to the Newbigging skeletons also. Contrasting those indications with what actually obtained amongst savage nations till recently, we have sound grounds for supposing that not improbably it was the custom amongst these ancient inhabitants of Great Britain, on the death of a chief, which in the above instances the conditions of burial would indicate the skeletons of the males to be, his wife was killed, possibly dismembered, and buried along with him, as well as one of his or her retainers. Of the round skulls at Cambridge two are those of men (Nos. 322 and 323), and one that of a woman (No. 330). Of the dolichocephalic skulls, one (No. 329) is a female; the other three (Nos. 325, 326, and 327) I have been obliged to classify as of doubtful sex. Many of their characters are female, but in some important respects they differ very considerably from that sex. Their imperfect condition renders it, without the other bones of the skeleton, impossible to determine their sex accurately. In the "Crania Britannica" they have been tabulated as female skulls, but in Dr. Thurnam's original catalogue, now at Cambridge, I find the following note:—"Crania 153-155" (these being the numbers the skulls had in Dr. Thurnam's collection) "were considered female, and are so marked. This seems quite doubtful." The skulls at Leeds and that at Edinburgh are male.

Capacity.—Reference to the accompanying table shows that the capacity of the dolichocephalic male skull No. 163 is amongst the smallest, while No. 322 in the Cambridge Museum is considerably larger than any of the others. The average capacity of the six males is 1534 cc., measured with mustard-seed, according to Professor Flower's method. In order to compare the different measurements of these ancient skulls with those of Scotchmen of the present time, I have given a table of the measurements of eight males, chiefly inhabitants of Caithness, in the College of Surgeons' museum. Unfortunately, want of material has prevented me from adding a similar table of measurements of the female skull, of which we only possess a solitary specimen. The average capacity of the recent skulls is 1,490 cc. The six ancient Orcadian skulls are, therefore, 44 cc. larger than the modern skulls. Compared to male Europeans generally, the average capacity of which, according to Topinard,[1] is 1,560 cc. (deduced from 347 skulls), the Orkney skulls are slightly smaller, though not so

[1] Topinard, "Revue d'Anthropologie," 2nd Series, vol. xv, p. 398, *et seq.*

much as might appear from a comparison of the figures, since those measured by Broca and Topinard were cubed with shot, which gives a somewhat greater result than if cubed with mustard-seed, according to Professor Flower's method.

The capacity of the female skulls presents a greater variety than the males. Here we have the two skulls from Skerrabrae, both of which are dolichocephalic, occupying the two extremes of the series, 346A measuring only 1,200 cc., while 346B measures 1,420 cc., showing a difference of no less than 220 cc. The average capacity of the four measured is 1,290 cc. Compared to the average capacity of European women given by Topinard,[1] these skulls are considerably smaller, the average capacity of 232 of the former being 1,375 cc. The difference between the average capacity of the ancient males and females is 244 cc., while that between male and female Europeans is 185 cc. The difference in capacity between males and females, however, does not seem, from the extensive researches of Broca and Topinard,[2] to have the same significance as was once attributed to it.

The three skulls of doubtful sex were so imperfect that the capacity of none of them could be taken. One, however, is complete enough to admit of the capacity being estimated from the length, breadth, and height, according to Broca's method.[3]

A glance at the table will show that it is impossible to obtain any information respecting the relative capacities of the dolichocephalic and brachycephalic crania.

In the table of measurements I have added a column of the capacities of the skulls, both ancient and modern, taken with shot, according to Broca's most recent system, as laid down in a paper by M. Topinard in the "Revue d'Anthropologie," 2nd Series, vol. v, p. 394, July, 1882.

Cephalic Index.—This is the relation of the breadth of the cranium to its length, the latter being taken as 100. Before we can discuss this subject we must first fix the points between which the measurements of breadth and length are to be taken. The breadth of the skull has been taken by different observers as the maximum width of the parietal region, or that between the upper parts of the squamosals, or simply the maximum diameter, whether it be a parietal or squamosal. This latter is now almost universally adopted, and is, I think, the most satisfactory method of estimating the cranial breadth. Unfortunately the same unanimity of opinion does not exist as to the measurement of length. In this country Professor Rolleston advocated strongly measuring the length between the ophryon and the most pro-

[1] Topinard, "Revue d'Anthropologie, 2nd Series, vol. xv, p. 398.
[2] *Loc. cit.*
[3] Broca, "Instructions Craniologiques," p. 112 (Paris, 1875).

minent part of the occipital bone, and this plan has been adopted by Drs. Barnard Davis[1] and Thurnam, and by Professor Flower. Broca and other continental anthropologists have adopted the maximum length between the glabella, or nasal eminence, and the most prominent part of the occipital bone. Professor Rolleston, advocating the first mode of measuring the length, seems to have based his preference for the ophryo-occipital length chiefly because at the ophryon, to use his own words, "the applied arm of the compasses comes there into nearer relations with the cavity containing the cerebrum,"[2] his object evidently being to ascertain the length of the brain cavity; and much might be said in favour of measuring in this way. Against it I think we may adduce the facts that the point on the occipital bone upon which the one arm of the calipers rests, if the other is resting on the ophryon, is lower down than when the glabella is taken as the starting-point. The result of this is that we do not get the true length of the head, as it is seen on the living subject. Again, the length of the head in the living is usually estimated as the distance between the glabella and the most posterior part of the occiput: this corresponds to the glabello-occipital length. These points also being maximums, can be more easily and accurately measured than by taking a point on the brow, which varies more or less according to the measurer. The glabello-occipital length is, upon the whole, perhaps, the measurement most commonly adopted by anthropologists. It is also most nearly represented in drawings of the *norma verticalis* of the skull. That an understanding be arrived at as to which of the two methods is to be

[1] I may point out that M. Topinard has made a slight mistake in his work on "Anthropologie" (1876), where he states that Drs. Barnard Davis and Thurnam agree with Broca and others in measuring the length of the skull. Dr. Davis defines his measure of length as being "from the glabella to the most prominent point of the occiput, *the glabella being regarded as an inch above the naso-frontal suture*" (the italics are mine).

The following comparison of the lengths of the Caithness skulls given in Table II, will be, I think, convincing proof of Dr. Barnard Davis's measurement being the ophryo-occipital length; the first column is the number of the skull; the second is the measurement of length as given in the "Thesaurus Craniorum," converted from the English to the metric scale; in the third column is the ophryo-occipital length, as measured by myself; while the fourth is the glabello-occipital length, as defined by Broca:—

	Measurement of length in "Thesaurus Craniorum."	Ophryo-occipital length.	Glabello-occipital length of Broca.
No. 176	188 mm.	188 mm.	195 mm.
„ 177	185 „	185 „	186 „
„ 178	178 „	179 „	184 „
„ 179	183 „	182 „	184 „
„ 180	188 „	187 „	187 „
„ 184	181 „	181 „	185 „
„ 185	171 „	172 „	177 „

[2] Greenwell and Rolleston, "British Barrows."

adopted is very necessary, as the difference in the cephalic index is often very considerable, according as the one or the other method is used, and the results cannot be compared. In the present uncertain state of matters I have thought it advisable to give both the glabello- and the ophryo-occipital lengths, and the cephalic index formed by each.

The glabello-occipital length ranges from 186 mm. to 193 mm. in the three males, and from 178 mm. to 187 mm. in the six females. In the three skulls of doubtful sex the variation is between 190 mm. and 198 mm. The ophryo-occipital length in the six males varies from 176 mm. to 193 mm., and in the females from 165 mm. to 185 mm., the two most brachycephalic skulls being the shortest and also the broadest. The variations in maximum breadth of the skulls are less than those of the length. Of the male skulls, the narrowest has a maximum breadth of 144 mm., while the broadest measures 149 mm., the average being 146·5 mm. Of the females, the narrowest is 132 mm., while the broadest is 146 mm., the average being 137 mm. The three uncertain skulls vary from 133 mm. to 137 mm. in breadth, the average being 134·5 mm. The cephalic index presents considerable variations, indicating thereby considerable variation in the form of the cranium, the lowest index being 69·4, and the highest 82·0. Classifying the skulls according to their cephalic index, calculated from the maximum breadth as compared to the maximum or glabello-occipital length (the latter being taken as 100), we find that the male skull 163, and the female skulls 346A, 346B, and 165 of the College collection, and 325, 326, 327, and 329 (one female, and three of doubtful sex) of the Cambridge collection, or eight out of fifteen skulls, belong to the true dolichocephalic class of Broca; 323 (a male) of the latter collection is sub-dolichocephalic; the male skull 162 of the College collection, and 324 (a male) and 330 (a female) of the Cambridge collection, as well as the male skull at Edinburgh, and that at Leeds, or five out of the fifteen, are mesaticephalic, while 164 of the College collection is sub-brachycephalic.[1]

Calculating from the ophryo-occipital length and maximum breadth, and grouping the skulls according to their cephalic

[1] Broca's table of classification of crania, according to the cephalic index, as given in the "Revue d'Anthropologie," vol. i, p. 385 (1872), and in the "Instructions Craniologiques," p. 179, (1875), is as follows:—

Dolichocephalic	True dolichocephalic, below and up to	75·0		
	Sub-dolichocephalic, from	75·0	to	77·8
Mesaticephalic	„	77·8	to	80·0
Brachycephalic	Sub-brachycephalic, „	80·0	to	83·3
	True brachycephalic, above	83·0		

index, as Professor Flower has done,[1] a plan which has been followed in most of the recent monographs read before this Institute, we have results somewhat different. 325, 326, 327, 329, and 346B, or five out of fifteen, are dolichocephalic; 346A 165, 163, 323, 324, and the Leeds skull, or six of the fifteen, are mesaticephalic; while 162, 164, 330, and the Edinburgh skull, or four of the fifteen, are brachycephalic. Comparison with the table of measurements of the eight modern Scottish male skulls shows that while by Broca's classification the ancient skulls are either truly dolichocephalic or mesaticephalic, one half of the modern skulls are sub-dolichocephalic, and two are mesaticephalic; or by Professor Flower's method, while the ancient skulls are almost equally divided amongst the three classes, the modern skulls are all mesaticephalic except two, which are brachycephalic.

An interesting and instructive table may be compiled by placing the indices obtained by each method side by side, arranging the series of skulls according to their cephalic index, and indicating the locality from which each was obtained, and its sex. This I have attempted to do below.

A.—ANCIENT ORCADIAN SKULLS.

Cephalic Index calculated from Maximum Length (Glabello-Occipital) and Breadth.

True dolichocephalic.

No. of skull.	Sex.	Index.	Locality.	
327	doubtful	69·2	Burg	Saverough.
325	„	69·4	„	„
326	„	70·0	„	„
346A	♀	70·6	Picts' House	Skerrabrae.
346B	♀	72·3	„	„
329	♀	74·6	Cist	Harray.
165	♀	75·0	„	Rendall.
163	♂	75·0	„	Townhill.

[1] Professor Flower has proposed the following classification, according to the cephalic index, Osteol. Cat. Roy. Coll. Surg. Mus., Part I, p. 251 (1879):—

Dolichocephalic	below 75·0
Mesaticephalic	75·0 to 80·0
Brachycephalic	above 80·0

Sub-dolichocephalic.

323	♂	77·2	Burg	Saverough.

Mesaticephalic.

Leeds[1]	♂	77·9	Burg	Saverough.
324[1]	♂	78·0	„	„
162	♂	79·6	Cist	Newbigging.
330	♀	80·2	Burg	Sanday.
Soc. Ant. Scot.[1]	♂	81·0	„	Saverough.

Sub-brachycephalic.

164	♀	82·0	Cist	Rendall.

CEPHALIC INDEX CALCULATED FROM OPHRYO-OCCIPITAL LENGTH AND MAXIMUM BREADTH.

Dolichocephalic.

No. of skull.	Sex.	Index.	Locality.	
325	doubtful	70·5	Burg	Saverough.
327	„	72·1	„	„
346B	♀	72·3	Picts' House	Skerrabrae.
326	doubtful	72·7	Burg	Saverough.
329	♀	74·6	Cist	Harray.

Mesaticephalic.

346A	♀	75·0	Picts' House	Skerrabrae.
165	♀	75·0	Cist	Rendall.
163	♂	76·2	„	Townhill.
323	♂	77·2	Burg	Saverough.
Leeds	♂	78·7	„	„
324	♂	79·2	„	„

Brachycephalic.

162	♂	81·8	Cist	Newbigging.
164	♀	82·0	„	Rendall.
Scot. Ant. Scot.	♂	82·4	Burg	Saverough.
330	♀	83·6	„	Sanday.

[1] These indices are approximate only.

B.—MODERN SCOTTISH SKULLS.

Cephalic Index calculated from Maximum Length and Breadth.

True dolichocephalic.

No. of skull.	Sex.	Index.	Locality.
176	♂	72·3	Caithness.

Sub-dolichocephalic.

180	♂	75·9	Caithness.
178	♂	76·6	Lewis.
184	♂	77·3	Caithness.
346	♂	77·7	Highlands.

Mesaticephalic.

177		78·5	
185		79·1	Highlands.

Sub-brachycephalic.

179	♂	81·5	Caithness.

Cephalic Index calculated from Ophryo-Occipital Length and Maximum Breadth.

Mesaticephalic.

176	♂	75·0	Caithness.
180	♂	75·9	,,
178	♂	78·8	Lewis.
177	♂	78·9	Caithness.
176	♂	79·0	,,
184	♂	79·0	,,

Brachycephalic.

185	♂	82·0	Highlands.
179	♂	82·4	Caithness.

Index of Height.—Calculated from the glabello-occipital length and basi-bregmatic height, this averages in the six male skulls 75·2, and in the six females 71·9; calculated from the ophryo-occipital length it is 76·3 in the males, and 72·0 in the females. The height index of the eight modern male skulls is 72·7 by the first method, and 74·1 by the second. The basi-bregmatic height varies little in the individual skulls of either sex, except in the female 165, in which it is exceptionally low, measuring 10 mm. less than in the brachycephalic skull 164, which was found only a few feet from it. The frequent lowness of the vault of the cranium in the dolichocephalic race observed by Professor Rolleston[1] is further illustrated by skull 326, which is only 124 mm. in height. The average height of the six male skulls is 141 mm., and of four females 129·2 mm., a sexual difference of 11 mm. Compared with the maximum breadth, which averages in the male skulls 146·5 mm., in the females 137·0 mm., we find the height is less in all cases; the difference between these measurements averaging in the males 5·5 mm., and in the females 7·8 mm.; or the average height to the average breadth is in the males as 97·3 to 100, and in the females as 94·2 to 100.

The Circumference.—The horizontal circumference of the male skulls averages 531 mm., while that of the females is 508 mm., or 23 mm. less than the males; that of two of the skulls of doubtful sex perfect enough to be measured is 518 mm. Compared with the eight male modern skulls the ancient ones are somewhat larger in circumference, the former averaging 524 mm. The moieties of the circumference anterior and posterior to the auriculo-bregmatic line, or the pre-auricular and post-auricular circumferences of the ancient skulls, of both sexes, are so variable that from the small number examined no deductions can be drawn as to the relative sizes of each in the dolichocephalic and brachycephalic races. In skull 326, one of doubtful sex, the pre-auricular circumference is less than that of any of the female skulls, a fact which seems to point to deficient frontal development, in this instance at least.

The transverse vertical circumference is exactly the same in the three ancient male skulls, measuring 490 mm. in each. In the modern skulls it averages 452 mm., or 38 mm. less than in the ancient. In the ancient brachycephalic female this measurement is considerably greater than in the dolichocephalic skulls of the same sex, being in the former 443 mm., and averaging in the latter 418 mm., or 25 mm. less. In No. 326, of doubtful sex, it is 415 mm., or 2 mm. more than that of the lowest female skull. The antero-posterior vertical circumference, obtained by adding the longitudinal arcs, the length of the foramen magnum, and the

[1] "British Barrows," by Greenwell and Rolleston, p. 640 (1877).

basi-nasal length together, averages in the ancient males 523 mm., in the females 496 mm., and in the modern males 513 mm.

Projections.—In whichever way these are measured, whether, as Broca has done, with the skull placed so that the condylo-alveolar line is horizontal, or, as Professor Flower has recommended, with the axis of vision horizontal, it is almost impossible to obtain accurate measurements. Certainly Professor Flower's method is the more accurate, but even when taken in this way, with the most improved instrument, such as I exhibit to-night, in which the skull is adjusted to the proper position by means of a screw, a variation of 2 to 3 mm. occurs in the same skull when measured at different times. Though this may not matter so much in the anterior and posterior projections, yet 2 mm. is a considerable variation in the facial projection.

The figures given in Tables I and II are the average results of several independent measurements at different times. The average total projection of the two males is 199 mm., and of eight modern males 196 mm. The average of four females is 185 mm. The total projections of the brachycephalic female is shorter than that of the three dolichocephalic females, being 181 mm. in the former, and averaging in the latter 186 mm.

As I think it instructive to show the individual measurements from which those of the projections of the ancient Orcadian skulls given in Table I were arrived at, I append them in the following table:—

PROJECTIONS.

	Ant. Proj.	Post. Proj.	Facial Proj.
No. 162			
1st Meas$^{t.}$	100 mm.	101 mm.	25 mm.
2nd „	100 „	100 „	26 „
3rd „	99 „	100 „	27 „
4th „	100 „	100 „	26 „
5th „	100 „	101 „	28 „
No. 163			
1st Meas$^{t.}$	99 mm.	98 mm.	25 mm.
2nd „	97 „	100 „	15 „
3rd „	98 „	101 „	20 „
4th „	100 „	102 „	23 „
5th „	98 „	100 „	14 „
No. 346A.			
1st Meas$^{t.}$	97 mm.	90 mm.	22 mm.
2nd „	95 „	92 „	20 „
3rd „	95 „	94 „	23 „
4th „	94 „	91 „	18 „
5th „	96 „	94 „	22 „
6th „	95 „	93 „	20 „
7th „	96 „	93 „	21 „
No. 346B.			
1st Meas$^{t.}$	91 mm.	92 mm.	9 mm.
2nd „	88 „	96 „	8 „
3rd „	88 „	99 „	11 „
4th „	86 „	98 „	8 „
5th „	89 „	99 „	10 „
6th „	88 „	98 „	11 „
7th „	88 „	99 „	8 „

The auriculo-orbital width varies considerably in the female skulls: in the two from Skerrabrae it is 61 mm., while in the Rendall skulls it is 66; in three male skulls it averages 71 mm., and in the modern males 65·2.

Gnathic Index.—This ranges from 91·8 to 102·1, giving an average in males and females, between which there does not seem to be any difference, of 97·0. In all instances, except in the female skull 330, the basi-nasal length is greater than the basi-alveolar. The same condition obtains in the modern Scottish skulls. Both the ancient and the modern skulls belong to the mesognathous group of Professor Flower.[1]

The Facial Index, or the relation of the bi-zygomatic width to the ophryo-alveolar length, the former being taken as 100, is 75·8 in the females, and 73·9 in the males. In the females the indices of the dolichocephalic skulls are all higher than that of the brachycephalic skull. The facial index of the eight modern male skulls averages 74·4.

The inter-orbital width averages exactly the same in both the ancient and modern skulls, viz., 23·4.

The portion of the maxillary bones between the floor of the nose and the alveolar margin is well developed, averaging 23·3 mm. in the males, and 23·6 mm. in the females; in the modern skulls it averages 21 mm.

The form of the orbits vary; in some of the skulls they are round, as, for instance, in 346B, whereas in the majority they are of a square shape. The orbital index, or the relation of the height to the breadth, indicates this very well in the skull referred to, it being considerably higher than in the others. The only other skull of those exhibited which approaches this form is 165, in which the orbit is more or less round, though not so markedly as in the previous instance.

The indices show considerable variety, both in the individual skulls and in the sexes. The two male skulls on the table, 162 and 163, are microseme, and 323 at Cambridge is mesoseme, but the average index of the three (82·8) places them in the microseme group. Of the females 346A and 164 are microseme, the others are mesoseme, though 346B is within two decimal places of being in the megaseme group. The average of this index in the females is 85·0; they are therefore mesoseme. The average index of the eight modern skulls is 84·5; they are consequently

[1] Professor Flower divides crania, according to their alveolar indices, into the following categories (see Osteolog. Cat. Mus. Roy. Coll. Surg., Part I, p. 252, 1879):—

Orthognathous	below 98·0
Mesognathous	98·0 to 103·0
Prognathous	above 103·0

mesoseme, though half of them are microseme, as an examination of the table will show.

Nasi-malar Angle.—This angle could only be measured in a few of the skulls on account of the imperfect state of some of them. In the male skull 162 the angle approaches the size it obtains in the Mongolian skulls, which are distinguished by their flatness in this region, and consequently high nasi-malar angle. The slope of the nasi-orbital plane in the modern skulls corresponds to that of skull No. 163, averaging in them 135°. In the females the backward and outward slope of this plane is still greater than in the males, the nasi-malar angle being in them 128°—132°, except in No. 330 of the Cambridge collection, where it is 143°. It is worthy of observation that this angle is highest in the brachycephalic skulls.

The Nasal Index varies from 40·2 to 58·1, being rather greater in the females than in the males; consequently the form of the nasal aperture is broader in them than in the males. From the small number of male skulls not much importance can be attached to this comparison however, and the indices of both sexes may be included in one average; no perceptible difference seems to exist between the indices of the brachycephalic and the dolichocephalic skulls. The average index of all the skulls is 48·7; they are therefore mesorhine. The average index of the modern male skulls is 48·2, so that they correspond very closely with the ancient. Regarding the form of the nasal bones, and other nasal characters, I shall have something further to say.

The Palatal Index is higher in the male skulls than in the females, the average index of the former being 121·3, and 113·4 in the latter. The skull of uncertain sex shows a considerable variation from the others in that this index is much higher, being 128·0. The palatal index of the eight modern male skulls is 112·1; lower, therefore, considerably, than in the ancient males, and corresponding to that of the females. The measurements of the palate, from which these indices are derived, differ from Broca's in that the length is measured from the aveolar point to the centre of a line drawn across the maxillary tuberosities, and the breadth is the maximum between the outer borders of the alveolar arch, as described by Professor Flower.[1]

The Mandible.—The bigoniac width shows a marked sexual difference, the average for the males being 104·5 mm., while that of the females is 89 mm., or 15·5 mm. less than the males. A corresponding difference in width is shown by the bicondylar width. The height of the symphysial posterior is also smaller in the females by 6 mm. on the average; but the

[1] See "Memoir on Fijian Crania" ("Journ. Anthrop. Inst.," Nov., 1880, p. 161).

molar height does not maintain the same relation, the difference between the two sexes being only 3·3 mm. less in the females than in the males. The sexual difference is still more marked in the height of the coronoid, which in the males averages 70·7, and in the females 57·3 mm, or 13·4 mm. less. The difference in length of the portion of the ramus between the gonion and the symphysis averages 16·8 mm. in the two sexes, the females being the shorter by that amount. The height of the ascending ramus and its antero-posterior breadth shows also considerable difference in the two sexes, being considerably smaller in the female.

The form of the mandible in the skulls of uncertain sex approaches more nearly to the male type, as indicated by those before us, than to the females.

The mandibular angle in the males averages 116·3°, and the symphysial 77·5°; in the modern skulls the average of the former angle is 121·6°, and of the latter 72·2°; the chin in the modern is therefore more pointed than in the ancient skulls. In the females the mandibular angle averages 122°, and the symphysial 83·2°.

Having now directed attention to the principal characters indicated by our table of measurements, there remain yet to be described certain morphological details which cannot be expressed by ordinary measurements; these are indicated in the various *normæ*, viz.: *norma lateralis*, *norma verticalis*, *norma frontalis*, *norma occipitalis*, and *norma basilaris*, which I will not treat *seriatim* in each skull, but give the general results. All the skulls are those of adults, varying, probably, from between thirty to seventy years of age.

The Condition of the Teeth.—In skull 162 several of the teeth have been lost after death, but the first right lower molar during life. Those that remain are considerably worn down, and have tartar deposited upon them. In No. 163 the last right upper molar is absent, and there is no trace of its ever having been developed. The teeth are somewhat worn, but not more so than usual in a man of middle age; traces of the cusps still remaining, and a fifth tubercle is present on the last lower left molar. The skull 323, at Cambridge, has almost all the teeth present except the wisdom teeth, which appear never to have been developed; but they are very much worn, and the surfaces are "oblique and jagged, as if from gnawing roots or tearing flesh from bones," as Dr. Thurnam has very aptly expressed their condition.[1] In the skull at Leeds one of the wisdom teeth is absent, and the others are considerably corroded, but not quite so advanced in wear as in the previous skull, the skeleton having

[1] "Gentleman's Magazine," *loc. cit.*

been that of a young man about thirty years, while No. 323 is that of an older man. The skull in Edinburgh presents a condition of the teeth, as regards wear, similar to that in the Leeds skull. Of the female skulls the teeth of No. 346A are very much worn, but in excellent preservation; the cusps have been worn away. In No. 346B they are normal and very little worn; a small fifth tubercle is developed on the last left lower molar. In No. 165 the teeth are all lost; several have been lost during life, and the alveolar margin is shrunk. Those of No. 164 are very much ground down, and have tartar deposited upon them. Dental prognathism is indicated in No. 346A. In none are the teeth abnormal in size. In those of doubtful sex the teeth are worn down, but in good condition in No. 325.

The Sutures.—In No. 162 they are much obliterated and difficult to trace, owing to the skull having been painted over with preservative material. Generally speaking, their condition as to closure seems to be indicated by No. 3 of Broca's standard tables,[1] while their complication is represented by No. 3 of the same author. Those of skull 163 correspond to 2 and 3, both in their complication and closure. In No. 346A the complication of the chief sutures is represented by 2 to 4, and the degree of closure by 3. The wormian bones are medium sized, Nos. 2 and 3 ("*moyens*" of Broca). In 346A the sutures correspond to 3 and 4 in complication, and 3 as to their state of occlusion; there are few wormian bones, and those are small ("*petit*" of Broca, No. 1). In skull 164 the sutures can hardly be traced, their occlusion corresponding to No. 0. In skull 165 they vary in complication from 2 to 4, and 2 to 3 as to their state of closure; the wormian bones are small, being represented by No. 1.

The other skulls at Cambridge which I have examined show similar conditions as to complications and closure of the sutures. It may be generally stated that the sutures of these skulls are, could the term applied by Broca to indices be used, "mesoseme." In none of the skulls, either in the College of Surgeons' museum or in the museum at Cambridge, is there metopism, or persistence of the frontal suture, present. The basilar suture is closed in all the skulls.

The development of the inion is feeble, never more than is represented by Broca's figure[2] No. 1, and in 346B and 164G No. 0.

In skull 163 an epipteric bone is developed; this is of triangular shape, and does not stretch across the whole width of the *ali-sphenoid*, which accordingly articulates antero-superiorly with

[1] "Instructions Générales pour l'Anthropologie," Pl. VI (1865).
[2] *Ibid.*

the frontal, postero-superiorly with the parietal and epipteric, and postero-inferiorly with the temporal.

Some of the skulls are what Mr. Busk calls *phænozygous*, or partially so: that is to say, in the *norma verticalis*, when held at arm's length and looked at with one eye, the other being shut, both zygomatic arches are to be seen at the same time. The condition depends upon the comparative development of the fronto-parietal region, and the zygomatic arches. It is complete in skulls 162 and 346A, and partial in 346B. The zygomatic arches being broken in several of the series, it is impossible to tell the condition which obtains as a rule. In No. 164, however, nothing can be seen of the arches.

The *tubera* of the parietal bones are well marked in 364A, a condition which does not obtain in the other skulls I have examined. The prominence of the tubera is associated, in this instance, with a narrowness of the base of the skull, conditions found by Weisbach[1] usually to co-exist, and considered by him to be a child-like character retained most commonly in female skulls which have failed to attain the rounding out of the parietes which occurs from the latest expansion of the brain.[2] This skull shows, to some extent, the "ill-filled" condition of Cleland[3] which does not obtain in the other skulls, and which is in keeping with the prominent tubera.

Asymmetry of the posterior part of the cranium occurs in some of the skulls. In No. 162 it exists on the left side, and in Nos. 346A and 346B on the right side. The distortion in the first-mentioned specimen has been commented on by Dr. Barnard Davis, who thinks it open to question as to whether or not the early Britons were in the habit of distorting the skulls of their children, a custom which has been traced to exist in many parts of Europe in early times, as well as amongst the savage races of America and Polynesia, &c. The distortion, such as is seen in the skulls before us, is often found to be on the right side, as in two of these three skulls in which it occurs, and has been attributed by some to the skull having lain for a number of years on the same side, and having been subject to superincumbent weight. Others have attributed it to the subject of it having been carried when an infant with the head pressed against the person of the mother, and have accounted for the deformity being most frequently found on the right side by the fact that mothers are usually right-handed, and in order to have this hand free they would naturally carry their children on the left arm; the right side of the child's body would there-

[1] "Arch. f. Anthropologie," vol. iii, p. 68.
[2] Cleland, "Phil. Trans.," 1870, p. 149.
[3] *Loc. cit.*

fore be next to the left of the mother's. The question as to whether or not the distortion, such as is present in these skulls, and in those figured by Professor Huxley in the "Prehistoric Remains of Caithness," is not due to simple asymmetrical development of the skull, has not, I think, received the importance that is due to it. It is a fact well-known to all who have made investigations on the form of bones that asymmetry is one of the most common occurrences in the skeleton and for which no cause can be assigned. It is also clear that bones are not developed with any mathematical accuracy. Deformity from pressure is always accompanied, as far as I have seen, by a distinct *flattening* of the part where the pressure has been applied or acted upon. Now in the skulls before us, and in the others I have examined, there is no trace of any flattening: the outline presents an unbroken curve, only it is not symmetrical, on each side of the mesial line.

The form of the forehead varies considerably. The glabella is prominent in some and very flat in others, as is seen by comparing the ophryo- and glabello-occipital lengths. Again, the forehead in some of the skulls is almost perpendicular, while in others it recedes more rapidly. The accuracy of Professor Rolleston's assertion, that the forehead of brachycephalic skulls "is sometimes vertical, and especially in cases where the whole skull and skeleton are marked by great strength, or even ruggedness, it is markedly sloping," is well illustrated by skulls 164 and 162. The sloping of the forehead cannot, however, be considered to be a sign of deficient development of the anterior lobes of the brain, or a vertical forehead of the reverse without reference to the rest of the head, and in neither of these skulls is there any deficiency in the total circumference, or in the pre-auricular portion of it. The deficiency occasioned in No. 162 by the backward sloping of the frontal bone is made up by the extra width of that bone, as indicated by its maximum breadth. The different cranial measurements of No. 164, likewise, show that it is in all respects well balanced, the shortness being compensated for by greater breadth, while the circumference remains the same as in the other skulls. The sloping backwards of the cranium is always more marked in males than in females, a fact that is illustrated very clearly in this series of skulls. Prominent supra-orbital ridges coupled with a prominent overhanging glabella, as in skull 162, causes the forehead to have the appearance of receding much more than it does in reality.

The supra-orbital ridges are well developed for a female in the skull 346A, and also in the skulls of doubtful sex at Cambridge, while they are very flat in the others I have examined. The form of the forehead, as to breadth, is well indicated by the minimum frontal diameter. It is narrowest in the dolicho-

cephalic skulls. 346B exhibits a peculiar roundness and well-filled appearance of the frontal region, together with a degree of sharpness of the forehead which is not observable in the other skulls, except it be in No. 163. A front view of No. 346A, fig. 2, Pl. I, exhibits, besides the narrowness of the frontal region, a marked asymmetry of the tempero-parietal portion of the cranium, which is twisted round to the left side: this is especially well seen in a stereoscopic tracing of the *norma frontalis*. The profile of the region of the glabella is represented by the following numbers of Broca's table[1]:—162, by outlines No. 3; 163, by No. 2; 346A, by No. 1; 346B, 164, and 165, by No. 0.

The auriculo-bregmatic line.—When the cranium is placed with the axis of vision horizontal, this line is in all the skulls, and in both sexes, inclined forward at the upper end, a condition which Professor Flower found to obtain in the Andamanese skulls, while in European skulls this line, he says, is usually vertical, or may incline backwards.[2] In the eight modern Scottish skulls I find that in four the line is inclined more or less forwards, and in four more or less backwards.

The characters presented by the form of the nose can, unfortunately, only be imperfectly studied in this series, because in several of the skulls the nasal bones are broken, as is also the nasal spine. In No. 162 the outline of the curve of the nasal bones is represented by No. 4 of Broca's table,[3] and the nasal spine by No. 2; in skull 163 the nasal bones by No. 3, and the spine by No. 1; in 346A the nasals by No. 4, and the spine by No. 2; in 346B the nasals by No. 3, and the spine by No. 2; in No. 165 the nasals by No. 4, and the spine by No. 2 or 3. The base of the nose is narrow, and the nasal bones are usually laterally compressed at their basal suture, except in skull 165, in which the root of the nose is flat. The nasal bones are narrow superiorly, and broaden as they descend and project forwards. The lower margin of the nose is well formed, a well-marked ridge existing between the floor of the nasal cavity and the anterior or facial surface of the maxilla.

The malar bones are heavy in No. 162, being deep from above downwards. In this respect considerable difference is manifested in the various skulls, as, for example, between 346A and 346B, in the latter the malars are heavier than in the former.

The Pelvis.—Next in importance to the form of the skull in determining rare characters is the pelvis. Unfortunately we have only a single specimen of this part of the skeleton, that

[1] "Instructions Générales pour l'Anthropologie," Pl. VI.
[2] "Journ. Anthrop. Inst.," Nov., 1879, p. 42.
[3] *Loc. cit.*

belonging to the female skeleton 346A. In the general appearance the bones are somewhat rugged, and in this respect resemble those of a male. This is probably due to the subject having possessed a strongly developed muscular system. The measurements which I have found to be of chief importance are given in the following table, and have been taken in the manner recommended by me in a previous paper:—[1]

	Measurements of ancient Orcadian pelvis.	Average of these measurements in Europeans.
Sacral length	110 mm.	101 mm.
Sacral breadth	125 „	118 „
Ant. sup. iliac spine width ..	245 „	231 „
Inter-iliac crest width	270 „	271 „
Pelvic height	207 „	201 „
Iliac breadth	154 „	157 „
Posterior superior iliac spine width	79 „	84 „
Acetabulo-symphysial width ..	124 „	117 „
Pubo-ischeal depth	94 „	91 „
Antero-posterior diameter of brim	101 „	106 „
Transverse diameter of brim ..	132 „	133 „
Antero-posterior diameter of outlet	115 „	116 „
Transverse diameter of outlet..	102 „	116 „
Sub-pubic angle	76° „	76° „

The chief points of difference in the ancient Orcadian pelvis from the average modern European pelvis consist in the large size of the sacrum, it being both longer and broader than usual. The anterior superior iliac spines are farther apart, consequently the outline of the iliac crest is not so much curved as usual; the distance from the posterior border of the acetabulum to the symphysis is longer, and the pubo-ischeal depth is somewhat greater than the average; the antero-posterior diameter of the brim is shorter, and the transverse diameter of the outlet is somewhat narrower than usual. The transverse diameter of the brim, the crest width, breadth of the sub-pubic angle, and most of the other measurements correspond to the average of European females. The pelvic index, or the relation of the antero-posterior to the transverse diameter (the latter being taken as 100), which indicates the fundamental form of the pelvis, is 76·5, while that of 35 Europeans, given in Table II of my paper, already cited, is 82·2. The transverse diameter of the pelvic inlet is therefore greater in proportion than the antero-posterior. The opposite condition obtains at the outlet, where the antero-posterior diameter is greater in proportion to transverse. The pelvic outlet presents decided male characters, as regards its transverse diameter, but those are compensated for by the sub-pubic angle

[1] "Pelvemetry," by J. G. Garson, M.D. ("Journ. of Anat. and Phys.," vol. xvi, p. 106, 1881)

being decidedly female in character; indeed I have only measured one male pelvis which had so large an angle as 76°, the average sub-pubic angle in the male being 64°. The form of the pelvis, taking all the measurements into consideration, does not exhibit any signs of being that of a low type, and, but for the shortness of the antero-posterior diameter of the brim, and the narrowness of the outlet, would be perfectly normal.

The Limb Bones.

The following are the measurements of skeleton 346A, the only long bones of the ancient Orcadians I have been able to measure :—

	Right.	Left.	Mean.
Clavicle ..	136 mm. ..	140 mm. ..	138 mm.
Humerus ..	325 „ ..	318 „ ..	321·5 „
Radius ..	241 „ ..	238 „ ..	239·5 „
Femur ..	445 „ ..	442 „ ..	443·5 „
Tibia ..	367 „ ..	367 „ ..	367 „

The mean length of the clavicle being 138 mm., and that of the femur 443·5 mm., the length of the former as compared with the latter (this being taken as 103) is 31·1. In the average European male skeleton the clavicle is to the femur as 32·7 to 100, as was pointed out by Professor Flower, who also found in the Andamanese[1] that the clavicle in the males is to the femur as 29·1 to 100, and in the females as 28·3 to 100. On the assumption, then, that the same proportion exists between the clavicle and femur of the two sexes, in Europeans as in Andamanese, the length of the clavicle to that of the femur of this ancient Orcadian would be exactly normal. In the skeleton of a French woman in the College museum the proportion of the clavicle to the femur is 30·6 to 100.

The combined length of the humerus and radius shows the right limb to measure 566 mm., and the left 557; the right arm is therefore 10 mm. longer than the left. This condition is one which I have found to occur in two out of every three skeletons in a series of fifty which I examined. The combined lengths of the femur and tibia give a length to the right lower limb of 812 mm., and to the left of 809 mm.; the right extremity is therefore also the longer by 3 mm. This is somewhat contrary to what is generally the case, as I have pointed out,[2] that in 79 skeletons I found 41 instances where the left limb was the longer, and in these its average preponderance was 3·8 mm.;

[1] *Loc. cit.*
[2] "Journ. of Anat. and Phys.," vol. xiii, p. 502 (1879).

	Sex.	Capacity.		Length.								Indices.							
		1 With mustard-seed.	1a With shot No. 8, Broca's method.	2 Glabello-occipital.	2a Ophryo-occipital.	3 Maximum Breadth.	4 Height (Basi-occipital).	5 Minimum frontal Breadth.	6 Maximum frontal Breadth.	7 Bi-asteric Breadth.	8 Bi-auricular Breadth.	9 Cephalic Index 1.	9a Cephalic Index 2.	10 Height Index 1.	10a Height Index 2.	11 Transverse vertical Circumference.	12 Horizontal Circumference Total.	13 Pre-auricular Circumference.	14 Post-auricular.
162 Barnard Davis, R.C.S. ...	♂	1,570	1,690	186	181	148	142	101	127	113	128	79·6	81·8	76·3	78·5	460	532	240	292
163 ,, ,, ...	♂	1,450	1,580	192	189	144	140	99	117	114	128	75·0	76·2	72·9	74·1	460	535	245	290
323 Cambridge	♂	1,630	—	193	193	149	136	103	125	110	130	77·2	77·2	70·5	70·5	460	548	258	290
324 ,, ...	♂	1,472	—	Av. 186	183	145	142	—	119	107	—	78·0	79·2	76·3	77·6	—	520	—	—
Philos. Soc., Leeds	♂	1,571	—	Av. 190	188	148	142	—	127	114	—	77·9	78·7	74·7	75·5	—	541	—	—
Soc. Antiq. of Scot., Edinburgh ...	♂	1,512	—	Av. 179	176	145	144	—	119	114	—	81·0	82·4	80·4	81·8	—	510	—	—
346A R.C.S.	♀	1,200	1,290	187	176	132	132	93	106	100	118	70·6	75·0	70·6	75·0	417	496	240	256
346B ,, ...	♀	1,420	1,485	184	184	133	129	93	114	107	118	72·3	72·3	70·1	70·1	413	512	228	284
164 Barnard Davis, R.C.S. ...	♀	1,320	1,400	178	178	146	133	98	125	110	124	82·0	82·0	74·7	74·7	443	515	243	272
165 ,, ,, ...	♀	1,250	1,330	180	180	135	123	99	117	100	114	75·0	75·0	68·3	68·3	423	505	250	255
329 Cambridge	♀	—	—	185	185	Ap. 138	—	—	—	106	—	74·6	74·6	—	—	—	Ap. 520	—	—
330 ,, ...	♀	—	—	172	165	Ap. 138	—	90	112	100	113	80·2	83·6	—	—	—	Ap. 500	—	—
325 Cambridge	doubtful	—	—	193	190	134	—	95	113	110	—	69·4	70·5	—	—	—	520	—	—
326 ,, ...	,,	—	Est. 1,330	190	183	133	124	99	110	115	117	70·0	72·7	65·3	67·8	415	516	226	290
327 ,, ...	,,	—	—	198	190	137	—	98	115	110	—	69·2	72·1	—	—	—	—	—	—
176 Barnard Davis, R.C.S. ..	♂	1,555	1,595	195	188	141	134	102	115	111	125	72·3	75·0	68·7	71·3	455	530	245	285
177 ,, ,, ...	♂	1,556	1,590	186	185	146	132	106	127	122	120	78·5	78·9	71·0	71·4	450	543	240	303
178 ,, ,, ...	♂	1,525	1,575	184	179	141	140	99	115	105	122	76·6	76·6	76·1	78·2	455	515	233	282
179 ,, ,, ...	♂	1,600	1,655	184	182	150	138	104	129	114	125	81·5	82·4	75·0	75·8	475	535	264	274
180 ,, ,, ...	♂	1,475	1,535	187	187	142	132	97	116	114	123	75·9	75·9	70·6	70·6	442	527	247	280
346 R.C.S.	♂	1,525	1,595	194	191	143	138	97	117	106	128	77·7	79·0	75·0	76·2	451	515	233	282
184 Barnard Davis, R.C.S. ..	♂	1,400	1,465	185	181	143	132	102	121	108	123	77·3	79·0	71·3	73·0	448	526	240	284
185 ,, ,, ...	♂	1,300	1,350	177	173	141	132	93	119	105	124	79·1	82·0	74·6	76·7	445	500	245	255
Total	—	11,999	12,390	1,462	1,455	1,147	1,078	802	999	885	990	6,189	6,310	5,623	5,931	3,421	4,194	1,947	2,245
Average of eight	♂	149·0	154·37	182·2	182·0	143·4	134·7	100·2	125·0	110·6	124·0	77·4	78·8	72·7	74·1	452·6	524·2	243·4	280·6

(1) Taken after Professor Flower's method, with mustard-seed.
(1a) Taken after Broca's method, with shot No. 8.
(3) Calculated from the glabello-occipital (maximum) length and maximum breadth.
(10) Calculated from the glabello-occipital length and basi-bregmatic height.
(10a) ,, ,, ophryo-occipital length and basi-bregmatic height.
(20–23) Estimated with the visual axis horizontal.

The other measurements
Craniologiques, Memb. A
which is taken according

TABLE I.—MEASUREMENTS OF ANCIENT SKULLS FROM THE ORKNEY ISLANDS.

ence.	14 Post-auricular.	Transverse Arcs. 15 Frontal.	16 Bregmatic.	17 Parietal.	18 Occipital.	Midian Arcs. 19 Frontal.	20 Parietal.	21 Occipital.	22 Total Fronto-parieto-occipital.	Foramen Magnum. 23 Length.	24 Breadth.	25 Basi-nasal Length.	26 Total longit. Circumference 22 × 23 × 25.	27 Basi-alveolar Length.	28 Gnathic or Alveolar Index.	Projections. 29 Facial.	30 Anterior.	31 Posterior.	32 Total.	33 Bi-zygomatic.	34 Bi-jugul.	35 Inter-orbital.	36 Height of Face.	37 Facial Index, 100⅓.
0	292	275	325	332	297	125	145	122	392	36	29	100	518	100	100·0	26	100	100	200	136	119	24	98	72·0
5	290	280	312	320	290	125	135	*Ap.* 123	383	*Av.* 38	—	104	525	98	94·2	19	98	100	198	—	—	20	101	—
8	290	282	322	333	285	137	127	124	388	39	33	100	527	93	93·0	—	—	—	—	140	119	26	106	75·0
-	—	—	—	—	—	137	122	117	376	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
-	—	—	—	—	—	134	142	119	395	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
-	—	--	—	—	—	122	132	114	368	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0	256	265	287	265	252	130	120	109	359	35	28	96	490	95	99·0	21	95	92	187	124	107	21	95	76·6
3	284	255	286	305	282	126	130	112	368	38	36	97	503	89	91·8	9	88	98	186	122	105	20	95	77·8
3	272	275	310	318	246	235	120	110	365	36	31	100	503	97	97·0	8	97	85	181	*Ap.* 125	108	23	92	73·6
0	255	277	303	305	250	130	134	90	354	37	—	98	489	95	96·9	17	94	92	186	124	110	23	93	75·0
-	—	—	—	—	—	137	131	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
-	—	255	—	—	*Ap.* 275	—	—	—	—	—	30	95	—	97	102·1	—	—	—	—	—	108	20	95	—
-	—	—	—	—	—	122	135	123	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	290	270	287	350	287	120	120	118	358	39	31	103	500	—	—	—	—	—	—	—	—	—	—	—
-	—	—	—	—	—	131	129	122	382	—	—	—	—	—	—	—	—	—	—	—	—	21	105	—

TABLE II.—MEASUREMENTS OF EIGHT MODERN SCOTTISH MALE SKULLS.

	285	275	310	325	300	132	120	135	387	38	28	104	529	102	98·1	14	101	99	200	134	118	21	100	74·8
	303	271	321	335	305	130	126	132	388	33	32	98	519	*Ap.* 96	98·0	14	94	99	193	127	118	24	98	77·2
	282	275	313	325	275	125	132	111	368	42	36	106	516	105	99·1	21	104	92	196	129	121	29	101	78·2
	274	290	332	337	280	143	122	116	371	38	32	102	511	97	95·1	23	96	100	196	137	—	21	104	75·9
	280	275	310	321	277	135	125	116	376	36	33	103	515	100	97·1	21	100	99	199	128	115	22	98	76·4
	282	264	314	327	285	132	128	124	384	34	30	94	512	95	101·1	24	96	102	198	130	117	24	95	69·2
	284	272	310	320	285	130	135	112	377	36	31	96	509	93	96·9	25	93	103	196	135	113	25	*Ap.* 99	73·5
	285	275	302	310	260	125	115	106	346	39	31	105	491	104	99·1	23	105	86	191	135	115	23	97	71·1
7	2,045	2,197	2,512	2,660	2,267	1,062	1,003	952	2,997	296	253	809	4,102	792	793·5	165	749	780	1,749	1,064	931	187	792	6,394
4	292·0	275·0	314·0	325·0	283·4	132·5	125·4	119·0	378·6	37·0	31·6	101·4	512·7	99·0	97·9	20·6	93·6	97·5	186·1	133·0	116·4	23·4	99·6	79·9

(*Ap.*) Means that the condition of the skull did not admit of the exact measurement being taken, but those given with this affix are correct to within one, or at most about two millimetres.

(*Est.*) Means estimated according to Broca's method, published in the "Instructions ... Memb. Anth. Soc., Paris," 1875; except the capacity taken with shot, according to instructions given in a paper by M. Topinard in the ... not be taken.

(*Av.*) Average measurements.

	Sex.	Capacity.		Length.								Indices.							
		1 With mustard-seed.	1a With shot No. 8, Broca's method.	2 Glabello-occipital.	2a Ophryo-occipital.	3 Maximum Breadth.	4 Height (Basi-occipital).	5 Minimum frontal Breadth.	6 Maximum frontal Breadth.	7 Bi-asteric Breadth.	8 Bi-auricular Breadth.	9 Cephalic Index 1.	9a Cephalic Index 2.	10 Height Index 1.	10a Height Index 2.	11 Transverse vertical Circumference.	12 Horizontal Circumference Total.	13 Pre-auricular Circumference.	14 Post-auricular.
162 Barnard Davis, R.C.S. ...	♂	1,570	1,690	186	181	148	142	101	127	113	128	79·6	81·8	76·3	78·5	460	532	240	292
163 ,, ,, ...	♂	1,450	1,580	192	189	144	140	99	117	114	128	75·0	76·2	72·9	74·1	460	535	245	290
323 Cambridge	♂	1,630	—	193	193	149	136	103	125	110	130	77·2	77·2	70·5	70·5	460	548	258	290
324 ,, ...	♂	1,472	—	186 *Av.*	183	145	142	—	119	107	—	78·0	79·2	76·3	77·6	—	520	—	—
Philos. Soc., Leeds	♂	1,571	—	190 *Av.*	188	148	142	—	127	114	—	77·9	78·7	74·7	75·5	—	541	—	—
Soc. Antiq. of Scot., Edinburgh ...	♂	1,512	—	179 *Av.*	176	145	144	—	119	114	—	81·0	82·4	80·4	81·8	—	510	—	—
346A R.C.S.	♀	1,200	1,290	187	176	132	132	93	106	100	118	70·6	75·0	70·6	75·0	417	496	240	256
346B ,, ...	♀	1,420	1,485	184	184	133	129	93	114	107	118	72·3	72·3	70·1	70·1	413	512	228	284
164 Barnard Davis, R.C.S. ...	♀	1,320	1,400	178	178	146	133	98	125	110	124	82·0	82·0	74·7	74·7	443	515	243	272
165 ,, ,, ...	♀	1,250	1,330	180	180	135	123	99	117	100	114	75·0	75·0	68·3	68·3	423	505	250	255
329 Cambridge	♀	—	—	185	185	138 *Ap.*	—	—	—	106	—	74·6	74·6	—	—	—	520 *Ap.*	—	—
330 ,, ...	♀	—	—	172	165	138 *Ap.*	—	90	112	100	113	80·2	83·6	—	—	—	500 *Ap.*	—	—
325 Cambridge	doubtful	—	—	193	190	134	—	95	113	110	—	69·4	70·5	—	—	—	520	—	—
326 ,, ...	,,	—	*Est.* 1,330	190	183	133	124	99	110	115	117	70·0	72·7	65·3	67·8	415	516	226	290
327 ,, ...	,,	—	—	198	190	137	—	98	115	110	—	69·2	72·1	—	—	—	—	—	—
176 Barnard Davis, R.C.S. ..	♂	1,555	1,595	195	188	141	134	102	115	111	125	72·3	75·0	68·7	71·3	455	530	245	285
177 ,, ,, ...	♂	1,556	1,590	186	185	146	132	106	127	122	120	78·5	78·9	71·0	71·4	450	543	240	303
178 ,, ,, ...	♂	1,525	1,575	184	179	141	140	99	115	105	122	76·6	78·8	76·1	78·2	455	515	233	282
179 ,, ,, ...	♂	1,600	1,655	184	182	150	138	104	129	114	125	81·5	82·4	75·0	75·8	475	538	264	274
180 ,, ,, ...	♂	1,475	1,535	187	187	142	132	97	116	114	123	75·9	75·9	70·6	70·6	442	527	247	280
346 R.C.S.	♂	1,525	1,585	184	181	143	138	97	117	106	128	77·7	79·0	75·0	76·2	451	515	233	282
184 Barnard Davis, R.C.S. ...	♂	1,400	1,465	185	181	143	132	102	121	108	123	77·3	79·0	71·3	72·9	448	526	240	284
185 ,, ,, ...	♂	1,300	1,350	177	172	141	132	95	119	105	124	79·1	82·0	74·6	76·7	445	500	245	255
Total	—	11,930	12,350	1,482	1,455	1,147	1,078	802	959	885	990	6,189	6,310	5,823	5,931	3,621	4,194	1,947	2,245
Average of eight	♂	149·0	15,437	185·2	182·0	143·4	134·7	100·2	120·0	110·6	124·0	77·4	78·8	72·7	74·1	452·6	524·2	243·4	280·8

(1) Taken after Professor Flower's method, with mustard-seed.
(1a) Taken after Broca's method, with shot No. 8.
(9) Calculated from the glabello-occipital (maximum) length and maximum breadth.
(9a) ,, ,, ophryo-occipital length and maximum breadth.
(10) Calculated from the glabello-occipital length and basi-bregmatic height.
(10a) ,, ,, ophryo-occipital length and basi-bregmatic height.
(29–33) Estimated with the visual axis, horizontal.
(47) Measured from the centre of a line passing behind the dentary alveolus of the maxillæ.

The other measuremen
Craniologiques, Memb. A
which is taken accordin
"Revue d'Anthropologie,

TABLE I.—MEASUREMENTS OF ANCIENT SKULLS FROM THE ORKNEY ISLANDS.

ence.	14 Post-auricular.	Transverse Arcs. 15 Frontal.	16 Bregmatic.	17 Parietal.	18 Occipital.	Midian Arcs. 19 Frontal.	20 Parietal.	21 Occipital.	22 Total Fronto-parieto-occipital.	Foramen Magnum. 23 Length.	24 Breadth.	25 Basi-nasal Length.	26 Total longit. Circumference 22×23×25.	27 Basi-alveolar Length.	28 Gnathic or Alveolar Index.	Projections. 29 Facial.	30 Anterior.	31 Posterior.	32 Total.	33 Bi-zygomatic.	34 Bi-jugul.	35 Inter-orbital.	36 Height of Face.	37 Facial Index, 100⅔.
0	292	275	325	332	297	125	145	122 *Ap.*	392	36 *Av.*	29	100	518	100	100·0	26	100	100	200	136	119	24	98	72·0
5	290	280	312	320	290	125	135	123	383	38	—	104	525	98	94·2	19	98	100	198	—	—	20	101	—
8	290	282	322	333	285	137	127	124	388	39	33	100	527	93	93·0	—	—	—	—	140	119	26	106	75·0
-	—	—	—	—	—	137	122	117	376	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
-	—	—	—	—	—	134	142	119	395	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
-	—	--	—	—	—	122	132	114	368	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0	256	265	287	265	252	130	120	109	359	35	28	96	490	95	99·0	21	95	92	187	124	107	21	95	76·6
3	284	255	286	305	282	126	130	112	368	38	36	97	503	89	91·8	9	88	98	186	122	105	20	95	77·8
3	272	275	310	318	246	235	120	110	365	36	31	100	503	97	97·0	8	97	85	181	125 *Ap.*	108	23	92	73·6
0	255	277	303	305	250	130	134	90	354	37	—	98	489	95	96·9	17	94	92	186	124	110	23	93	75·0
-	—	—	—	—	—	137	131	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
-	—	255	—	—	*Ap.* 275	—	—	—	—	—	30	95	—	97	102·1	—	—	—	—	—	108	20	95	—
-	—	—	—	—	—	122	135	123	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	290	270	287	350	287	120	120	118	358	39	31	103	500	—	—	—	—	—	—	—	—	—	—	—
-	—	—	—	—	—	131	129	122	382	—	—	—	—	—	—	—	—	—	—	—	—	21	105	—

TABLE II.—MEASUREMENTS OF EIGHT MODERN SCOTTISH MALE SKULLS.

5	285	275	310	325	300	132	120	135	387	38	28	104	529	102 *Ap.*	98·1	14	101	99	200	134	118	21	100	74·6
9	303	271	321	335	305	130	126	132	388	33	32	98	519	96	98·0	14	94	99	193	127	118	24	98	77·2
3	282	275	313	325	275	125	132	111	368	42	36	106	516	105	99·1	21	104	92	196	129	121	29	101	78·2
4	274	290	332	337	280	143	122	116	371	38	32	102	511	97	95·1	23	96	100	196	137	—	21	104	75·9
7	280	275	310	321	277	135	125	116	376	36	33	103	515	100	97·1	21	100	99	199	128	113	22	98	76·5
3	282	264	314	327	285	132	128	124	384	34	30	94	512	95	101·1	24	96	102	198	139	117	24	95	68·3
9	284	272	310	320	285	130	135	112	377	36	31	96	509	93	96·9	25	93	103	196	135	113	25	*Ap.* 99	73·3
5	255	275	302	310	260	125	115	106	346	39	31	106	491	104	98·1	23	105	86	191	135	115	21	97	71·8
7	2,245	2,197	2,512	2,600	2,267	1,052	1,003	952	2,997	296	253	809	4,102	792	783·5	165	789	780	1,569	1,064	815	187	792	5,958
·4	280·8	275·0	314·0	325·0	283·4	131·5	125·4	119·0	378·6	37·0	31·6	101·1	512·7	99·0	97·9	20·6	98·6	97·5	196·1	133·0	116·4	23·4	99·0	74·4

measurements according to Broca's method, published in the "Instructions s, Memb. Anth. Soc., Paris," 1875; except the capacity taken with shot, n according to instructions given in a paper by M. Topinard, in the thropologie," July, 1882.

(*Ap.*) Means that the condition of the skull did not admit of the exact measurement being taken, but those given with this affix are correct to within one, or at most about two, millimetres.

(*Est.*) Means estimated according to Broca's instru not be taken.

(*Av.*) Average measurement.

The measurements given of skulls 324, Philos. S

TABLE I.—MEASUREMENTS OF ANCIENT SKULLS FROM THE ORKNEY ISLANDS.

11 Transverse vertical Circumference.	12 Horizontal Circumference Total.	13 Circumference Pre-auricular.	14 Post-auricular.	Transverse Arcs. 15 Frontal.	16 Bregmatic.	17 Parietal.	18 Occipital.	Median Arcs. 19 Frontal.	20 Parietal.	21 Occipital.	22 Total Fronto-parieto-occipital.	Foramen Magnum. 23 Length.	24 Breadth.	25 Basi-nasal Length.	26 Total longit. Circumference 23 × 23 × 25.	27 Basi-alveolar Length.	28 Gnathic or Alveolar Index.	Projections. 29 Facial.	30 Anterior.	31 Posterior.	32 Total.	33 Bi-zygomatic.	34 Bi-jugul.	35 Inter-orbital.	36 Height of Face.	37 Facial Index, 100 33.	38 Height of Malar.
460	532	240	292	275	325	332	297	125	145	122 *Ap.*	392	36 *Av.*	29	100	518	100	100·0	26	100	100	200	136	119	24	98	72·0	28
460	535	245	290	280	312	320	290	125	135	123	383	38	—	104	525	98	94·2	19	98	100	198	—	—	20	101	—	28
460	548	258	290	282	322	333	285	137	127	124	388	39	33	100	527	93	93·0	—	—	—	—	140	119	26	106	75·0	28
—	520	—	—	—	—	—	—	137	122	117	376	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	541	—	—	—	—	—	—	134	142	119	395	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	510	—	—	—	—	—	—	122	132	114	368	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
417	496	240	256	265	287	265	252	130	120	109	359	35	28	96	490	95	99·0	21	95	92	187	124	107	21	95	76·6	18
413	512	228	284	255	286	305	282	126	130	112	368	38	36	97	503	89	91·8	9	88	98	186	122	105	20	95	77·8	21
443	515	243	272	275	310	318	246	235	120	110	365	36	31	100	503	97	97·0	8	97	85	181	*Ap.* 125	108	23	92	73·6	22
423	505 *Ap.*	250	255	277	303	305	250	130	134	90	354	37	—	98	489	95	96·9	17	94	92	186	124	110	23	93	75·0	22
—	520 *Ap.*	—	—	—	—	—	—	137	131	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	500	—	—	255	—	—	*Ap.* 275	—	—	—	—	—	30	95	—	97	102·1	—	—	—	—	—	108	20	95	—	22
—	520	—	—	—	—	—	—	122	135	123	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
515	516	226	290	270	287	350	287	120	120	118	358	39	31	103	500	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	131	129	122	382	—	—	—	—	—	—	—	—	—	—	—	—	21	105	—	—

TABLE II.—MEASUREMENTS OF EIGHT MODERN SCOTTISH MALE SKULLS.

555	530	245	285	275	310	325	300	132	120	135	387	38	28	104	529	102 *Ap.*	98·1	14	101	99	200	134	118	21	100	74·6	22
550	543	240	303	271	321	335	305	130	126	132	388	33	32	98	519	96	98·0	14	94	99	193	127	118	24	98	77·2	25
555	515	233	282	275	313	325	275	125	132	111	368	42	36	106	516	105	99·1	21	104	92	196	129	121	29	101	78·2	22
575	538	264	274	290	332	337	280	143	122	116	371	38	32	102	511	97	95·1	23	96	100	196	137	—	21	104	75·9	25
542	527	247	280	275	310	321	277	135	125	116	376	36	33	103	515	100	97·1	21	100	99	199	128	113	22	98	76·5	21
551	515	233	282	264	314	327	285	132	128	124	384	34	30	94	512	95	101·1	24	96	102	198	139	117	24	95	68·3	22
548	526	240	284	272	310	320	285	130	135	112	377	36	31	96	509	93	96·9	25	93	103	196	135	113	25	*Ap.* 99	73·3	20
545	500	245	255	275	302	310	260	125	115	106	346	39	31	106	491	104	98·1	23	105	86	191	135	115	21	97	71·8	24
21	4,194	1,947	2,245	2,197	2,512	2,600	2,267	1,052	1,003	952	2,997	296	253	809	4,102	792	783·5	165	789	780	1,569	1,064	815	187	792	5,958	181
2·6	524·2	243·4	280·8	275·0	314·0	325·0	283·4	131·5	125·4	119·0	378·6	37·0	31·6	101·1	512·7	99·0	97·9	20·6	98·6	97·5	196·1	133·0	116·4	23·4	99·0	74·4	22·

The other measurements according to Broca's method, published in the "Instructions Craniologiques, Memb. Anth. Soc., Paris," 1875; except the capacity taken with shot, which is taken according to instructions given in a paper by M. Topinard, in the "Revue d'Anthropologie," July, 1882.

(*Ap.*) Means that the condition of the skull did not admit of the exact measurement being taken, but those given with this affix are correct to within one, or at most about two, millimetres.

(*Est.*) Means estimated according to Broca's instruction not be taken.

(*Av.*) Average measurement.

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37 Facial Index, 100 × 38/39	38 Height of Malar.	39 Height of Alveolar.	40 Auriculo-orbital Length.	Orbit. 41 Width.	42 Height.	43 Index.	Nasal Aperture. 44 Height.	45 Width.	46 Index.	Palate. 47 Length.	48 Width.	49 Index.	Angles. 50 Facial (ophryo-alveolo-auricular).	51 Nasi-malar.	52 Basilar.	Mandible. Width. 53 Bi-condylar.	54 Begoniac.	Height. 55 Symphesial.	56 Molar.	57 Coronoid.	58 Gomo-symphesial width.	Of Ramus. 59 Height.	60 Antero-posterior Breadth.	61 Mandibular Angle.	62 Symphesial Angle.
·0	28	22	71	38	29	76·3	51	25	49·0	—	—	—	65°	142°	24°	—	104	36	30	70	99	67	36	114°	76°
—	28	24	72	40	33	82·5	53	25	47·2	54	65	120·4	69°	—	—	—	—	—	33	77	97	70	37	110°	79°
·0	28	24	70	39	35	89·7	57	23	40·2	54	66	122·2	73°	136°	27°	124	105	41	27	65	89	62	36	125°	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
·6	18	22	61	36	30	83·3	49	22	44·9	55	60	109·1	67°	131°	26°	108	85	35	24	57	85	48	32	123°	79°
·8	21	24	61	36	32	88·9	48	23	47·9	50	59	118·0	71°	130°	23°	112	93	33	28	64	76	46	29	121°	78°
·6	22	23	66	38	30	78·9	43	25	58·1	55	61	110·9	72°	132°	19°	—	89	31	29	57	*Ap.* 73	—	—	—	90°
·0	22	27	66	40	34	85·0	46	24	52·2	53	*Ap.* 60	113·2	69°	128°	22°	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	*Ap.* 31	26	—	79	—	—	—	—
—	22	22	63	37	33	89·2	46	23	50·0	52	60	115·8	63°	143°	—	—	—	—	—	—	—	—	—	—	—
—	—	18	—	—	—	—	—	—	—	57	73	128·0	—	—	—	—	99	35 teeth lost	27	—	90	72	35	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17°	117	99	22	22	59	85	66	28	126°	—
—	—	20	—	—	—	—	57	28	49·2	—	63	—	—	—	—	—	—	32	31	74	94	*Ap.* 66	32	109°	—
·6	22	17	64	40	36	90·0	51	24	47·1	53	63	118·8	72°	130°	20°	—	—	—	—	—	—	—	—	—	—
·2	25	*Ap.* 19	67	40	34	85·0	50	24	48·0	52	58	111·5	*Ap.* 75°	143°	15°	—	—	—	—	—	—	—	—	—	—
·2	22	24	71	40	35	87·5	52	23	44·2	58	64	110·3	68°	132°	28°	117	100	40	29	66	96	59	36	124°	76°
·9	25	21	66	43	35	81·4	53	25	47·2	55	60	109·1	72°	—	22°	121	95	33	27	64	90	61	34	125°	66°
·5	21	23	65	40	35	87·5	48	23	47·9	55	61	110·3	69°	133°	21°	115	95	38	30	64	89	67	37	118°	78°
·3	22	21	63	38	30	78·9	46	24	52·2	55	64	116·3	67°	141°	21°	125	104	35	27	62	88	67	29	124°	75
·3	20	—	60	40	33	82·5	53	26	49·1	—	—	—	*Ap.* 69°	136°	25°	—	—	—	—	—	—	—	—	—	—
·8	24	22	69	41	34	82·9	50	25	50·0	59	64	108·5	66°	130°	36°	124	99	32	28	67	89	69	35	117°	76°
958	181	147	525	322	272	6,757	403	194	3,857	387	434	7,848	558	945	188	602	493	178	141	323	452	323	171	608	371
·4	22·6	21·0	65·6	40·2	34·0	84·5	50·4	24·2	48·2	55·3	62·0	112·1	69·7°	135·0°	23·5°	120·4	98·6	35·6	28·2	64·6	90·4	64·6	34·2	121·6°	74·2°

instructions when the measurement could

ilos. Soc., Leeds, and Soc. of Antiq. Scot.,

Edinburgh, are entirely taken from measurements of these skulls given in the "Crania Britannica." They seem to agree in the mode in which they have been measured with those measured by us, but we do not guarantee their correctness, not having had an opportunity to verify them.

Some measurements, not given in the "Instructions Craniologique," have been added, *e.g.*, nasi-malar angle. Those are to be found in memoirs by Professor Flower, in the "Journ. of the Anthrop. Inst.," on the "Osteology of the Andaman Islands," and on the "Osteology of the Fijians."

in 20 instances the left was the longer, in these the preponderance was 2·9 mm.; while in 9 cases of the 70, the limbs were equal. Comparing the upper with the lower limb, and taking the mean length of each (that of the upper being 561 mm., the lower 810·5 mm.), we find that the *inter-membral index*, or the relation of the upper to the lower limb, the latter being taken as 100, is 69·3, which is identical with what Professor Flower found it to be in the European (69·2),[1] and little different from what Broca found it to be in nine skeletons of the same race (69·73).

The femero-humeral index, or the ratio of the humerus to the femur, the latter taken as 100, is (calculated from the mean lengths of each bone) 72·9, precisely the same as Professor Flower found it to be in eleven Europeans, Broca making it 72·2 in nine Europeans.

The femero-tibial index, or the ratio of the length of the tibia to the femur, the latter being 100, is 82·7, while in fourteen Europeans Professor Flower found it to be 82·1.

The humero-radial index, or the length of the radius for. d to that of the humerus, the latter being 100, which is perhaps the most important as a race character, is 74·1. Professors Broca and Flower independently ascertained this to be in twenty-three European skeletons 73·9. The length of the feet is, as nearly as can be estimated, about 24 c.m.

Only a portion of the left scapula accompanies the skeleton. This shows an united fracture of the acromion and part of the spine.

The humerus has no olecronon foramen, or supra-condyloid tubercle; its angle of torsion varies in the right and left bones; in the former it is 35°, and in the latter 26°.

The long bones are quite normal in all respects. The tibia measures, about the centre of its shaft, antero-posteriorly 31 mm., and transversly 20 mm., giving an index of 64·5.

General Conclusions.

It is evident that in this series of skulls we have not a single pure race to deal with, but two distinct races, which have existed at probably three different periods. The first, and apparently the oldest race, seems to be the long-headed people represented by the skulls from Skerrabrae, and those of doubtful sex from Saverough. We have next the round-headed race, which probably occupied the country for a considerable time. The earliest of these are probably represented by the skulls of

[1] "Journ. Anthrop. Inst.," November, 1879.

rounder form from Saverough, and the later by the skulls from Newbigging, Rendall, and Harray.

That the skulls from Skerrabrae and the dolichocephalic skulls from Saverough are more ancient than the more brachycephalic skulls is, I think, clear. First, as regards the Saverough skulls, their small size, if we consider them as those of males, which I am inclined to do, would indicate that they are those of an early race, since there is decided proof of the size of the head having increased as time has rolled on. The maxillary portion of the face is developed more fully in these dolichocephalic skulls than in any of the more brachycephalic skulls found with them—a condition which occurs to a marked degree in low races as in Tasmanians and Australians. The condition of the bones also indicates that they are of ancient date, though too much dependence cannot be placed upon this; still, skulls subjected to the same decaying influence would, if they belonged to the same period, most probably exhibit a corresponding condition as to preservation; but in the Saverough skulls we have those of uncer[illegible]ren more decayed than the brachycephalic skulls, which are comparatively fresh: therefore I think there can be little doubt that the one set is much older than the other. The rate of decay of bone in this tumulus would probably in any case be very slow, as the soil is composed of dry sand. That the Skerrabrae skulls are of ancient date, also, the history of the dwelling seems clearly to indicate; the only contra-indication of this being that the complete skeleton was found 3 feet above the level of the floor. The condition of one of the chambers renders it possible that the dwelling may have been attacked and partly destroyed by an enemy. Supposing this enemy to have been the round-headed race who evidently invaded the islands, the latest date we could assign to these skulls would be that of their arrival; but in the turbulent condition of society pointed out to have existed at that time by Dr. Trail, from the arrangement, as if for sentries, at the entrance to the chambers, it is quite as likely that the inhabitants of this dwelling were attacked and the building wrecked by their own race as by later comers, and probably more so. I may here remark that it would be very desirable to have this ancient dwelling of Skerrabrae more fully explored; possibly several chambers remain yet unexplored, and if the supposition is correct as to the dwelling having been attacked and destroyed by an enemy, human remains would most probably be found in the most interior chambers which have not yet been explored. Whether these Saverough skulls are older, or of about the same age as the Skerrabrae skulls, it is impossible to say. The only indication we have of the Saverough skulls being older than the Skerrabrae

ones is the fresher condition of the bones from the latter place. Both sets were buried in soil of much the same nature, but the mode of burial being different may account for the different conditions in which they are, the Saverough skulls being buried in stone cists, while the Skerrabrae ones were found in the sand, another indication, perhaps, that the owners of the latter perished in a hostile attack. In estimating the age of the two places some authorities have attached importance to the fact that no querns or hand-combs were found in Skerrabrae, while both were found in Saverough, as indicative that the former is older than the latter, and the burgs generally.

Next, regarding the skulls of rounder form from Saverough, I have placed them as earlier than the skulls from the single cists of the round barrows. My reasons for doing so are because in Saverough we have no traces of cremation having been practised, and from the total absence of more modern implements of domestic use and defence. It is true we have the history of the deer's-horn handle of some instrument with the trace of iron in it, and this is certainly difficult to account for. To throw doubt as to its being iron is an argument of a very weak character, and one which should not be resorted to; nor do we need to do so, as we have distinct proof that this tumulus was not undisturbed. I therefore am inclined to think that this handle has got into the mound at a later date, an occurrence which we find not unfrequently happens. An argument which has had some weight with me in regarding these skulls, or at least some of them, as being those of the early round-headed people, is that the burgs were evidently the strongholds in the country, an invading race would naturally seek to take possession of these in the first instance, and having done so would most likely bury their dead in close proximity to them, where the remains would be, as it were, under their eye at all times, and consequently not so liable to be disturbed by the hostile tribes as when buried in tumuli at some distance from their habitation.

At a later period, when the round-headed people were in full possession of the country, and when interment and burning the dead were practised, we have the people to whom the brachycephalic and dolichocephalic skulls found in tumuli containing single or compound cists, such as those of Newbigging, Rendall, and Harray, were found, though at this time we have both long and round skulls buried side by side. Thus we find skulls Nos. 162 and 164, those of persons of well-marked brachycephalic type, presenting characters of comparatively unmixed race, and, as far as I am able to judge by comparison of other skulls, agreeing with the type of brachycephalic people found in round

barrows throughout Britain. Quite different from these are the skulls Nos. 163 and 165, which belonged to persons of the same period, and which seem to me to exhibit traces of admixture. This is possibly what might be expected from the history of the three skulls Nos. 162, 164, and 165. The mode of burial of the first showed that he was of importance in his tribe. The second, buried along with another, a skull similar to No. 162, probably indicates that she was of the better class. These would more likely be of purer type than the lower classes, to which not unlikely No. 165 belonged. The conquered race would be more likely to intermingle with the lower classes than the upper classes of the conquerors; consequently we might expect to find mixed features amongst them—precisely what we find in No. 165, and also in No. 163. This latter, it will be remembered, was found in a short cist, which I think may have some indirect evidence, at least, as to his station in life. We find that the chiefs, both in Orkney and in the cists at Keiss, in Caithness,[1] were buried in cists measuring about 5 to 6 feet long; No. 165 was found in one only 3 feet long. No. 329, which, unfortunately, is in a very imperfect condition, closely resembles No. 165 in its physical characters, was also found in a short cist measuring 3 feet 10 inches long.

Have we any clue as to the time when these races inhabited the country? No direct answer can be given to this question, but there are certain indications of a negative character which give us some information on the point. The abundance of deer-horn found at Skerrabrae indicates that at the time when it was inhabited those animals were plentiful in the country. The presence of deer most probably would be associated with the existence of forests, of which there are many remains to be found in different parts of the island to the present day. When the Romans sailed round Scotland and visited the Orkney Islands, their historians tell us there were no forests at that time, and probably the deer had ceased to exist also. The fact that no metals of any kind whatever were found, and that all the implements were of the most primitive manufacture, points to the people belonging to the unpolished stone period. An important piece of evidence as to the antiquity of the burgs has been pointed out by Mr. Laing. At Breckness, near Stromness, there remains in the face of the cliff a part of a burg, the rest of it having been carried away by the sea. The curvature of the remaining wall shows the burg to have been 68 feet in external diameter; of this only 15 feet remain, upwards of 50 feet having been carried away. We must give the builders of this burg credit for placing it at least 50 feet or more from the edge of

[1] Laing and Huxley's "Prehistoric Remains of Caithness."

the cliff; consequently here we have a wasting of the coast-line of about 100 feet, at least, since the building of the burg. The coast-line at the place where the burg is situated is shelving, so that we have to deal with absolute wearing away by slow degrees, and not with any sudden collapse of the coast. "Those who know," as Mr. Laing remarks, "the slow rate at which a solid rocky coast is washed away, must feel that such facts as are exhibited by the section of the burg and cliff at Breckness are altogether incompatible with any theory that assigns the origin of burgs to recent date. The rock on which the burg stands is not exposed to the full force of the Atlantic, being mostly sheltered from the west by a point of rock" extending farther out. "The substance of the rock is very hard and homogeneous sandstone of the Devonian formation."[1] Unfortunately we have no data by which to estimate the wasting of rock of this kind. We know, however, of castles which have stood on the brink of precipitous rocks for centuries without there being any appreciable wasting of their foundations. We have seen that the burg of Oxtro must have existed for so long a period as to admit of its ruins being covered over to a depth of some feet with soil before the people of the bronze period deposited the ashes of their dead over its ruins. It appears to me, then, that the antiquity of the Skerrabrae skulls and those from Saverough, or at least some of them, may probably be very great; but we have no means of estimating in years how old they may be.

Next, then, as regards the age of the skulls found at Rendall, Newbigging, and Harray—those found in cists in single tumuli. Here we have somewhat better data, and are able to fix their age more nearly than that of the other skulls. Those seem to have existed probably somewhat before the bronze period of this part of Britain, as I can obtain no trace of any metals having been found buried with them; but we have, according to Mr. Petrie, stone implements sometimes found in cists similar to those in which they were interred. The custom of cremating the dead is usually assigned to the bronze period, and we have clear proof that this was the common method of disposing of the dead at that period in Orkney; but we have also abundant proof that cremation was practised at a time when metals were apparently unknown, or very scarce. The round barrows found in Orkney seem to correspond exactly to those of various other parts of Britain, except that in the latter we have bronze articles found. Allowing for the isolation of these islands, and for the longer time it probably took before the metals were as common as in England, I do not think we ante-date, but probably post-date, the existence of the people

[1] Laing, "On the Age of Burgs," *loc. cit.*

who buried in the round barrows of Orkney, if we attribute them with the same antiquity as those of the round barrows of England. The date of the introduction of bronze into England has been estimated by Canon Greenwell as being somewhere about the year B.C. 1000,[1] and the same authority considers the round barrows of England to belong to a period which centres more or less in B.C. 500.

Description of Plate I.[2]

Figs. 1 and 2, *Normæ frontalis et lateralis* of skull No. 346A, from Skerrabrae. Scale, one-third linear.
„ 3 and 4, *Normæ frontalis et lateralis* of skull No. 346B, from Skerrabrae. Scale, one-third.
„ 5 and 6, *Normæ lateralis et verticalis* of skull No. 164, from Rendall. Scale, one-third.

Professor FLOWER, Professor THANE, Mr. A. L. LEWIS, Mr. PARK HARRISON, Mr. C. ROBERTS, and Dr. J. RAE offered some remarks on the subject of the paper, and the author briefly replied.

Mr. PARK HARRISON exhibited and described a collection of photographs of inhabitants of the British Isles, which he regarded as representing the old Jutish type:—

Note on PHOTOGRAPHS *of* INHABITANTS *of* BRITAIN *of* JUTISH TYPE. By J. PARK HARRISON, M.A., M.R.A.S.

THE writer was struck, when paying a visit in Kent two years ago, with certain peculiarities in the physiognomy of a portion of the population round Canterbury, which he suspected might be due to Jutish blood. He consequently collected a number of photographs, and sent them to Dr. Beddoe, F.R.S., with the request that he would give his opinion on the subject. In reply, that distinguished anthropologist wrote to say that he found no difficulty in accepting the portraits as typical of the race above alluded to.

Mr. Harrison in the following year took some of the best specimens with him to the Isle of Wight, and spent several days in studying the native population in Newport and the district between that town and Ryde, which tradition says was peopled

[1] "British Barrows," p. 131 (1877).

[2] These photozincographs were reduced from drawings by Mr. J. G. Goodchild, the projections having been taken by the author with Broca's stereograph.

by the Jutes. The result was that precisely the same peculiarities were detected that had been observed in Kent.

Subsequently, on instituting a search for faces of similar type in South Hants, opposite the Isle of Wight, several were met with; whilst many more were observed which sufficiently contrasted with familiar English types in that part of the country to show that the blood was mixed.

The peculiarity of the Jutish features consists in the form of the nose and mouth. There is no nasal point, or tip, properly so called, as in the Danish, Cymric, and Iberian face, and their inter-crosses; nor is there any approach to the slight bulb which distinguishes the Saxon. The end of the nose is rounded off somewhat sharply, and the septum descends considerably below the line of the nostrils. The lips are less moulded or formed, and resemble the Iberian rather than the Saxon type. The lower lip, more particularly, is thick and deep. The Jutish profile has a strong resemblance to that sculptured in the Assyrian marbles.

It should be mentioned that there is an alabaster monument in Newport Church of De Horsey, who was Captain-General of the Isle of Wight in the sixteenth century. His profile closely resembles the type still existing in the neighbourhood, and it is said to be hereditary in the De Horsey family. Now it is important to note that Dr. Isaac Taylor considers *Horsey* as the Saxon equivalent for *Horsa*, a name common amongst the Jutes. Such survival of names, when joined with physiological similarities, is of more value than is generally assigned to it, in a racial point of view.

It will be well also to bear in mind that objects are met with in early graves both in the Isle of Wight and in Kent that are not found, for instance, in Sussex, or with Saxon interments elsewhere. This would appear to accord with the conclusions we arrive at from the physiognomy of the Jutes and Saxons, namely, that their race-origin was different.

Whether the same peculiarities exist in Jutland at the present day is not known; but the population there was, there is reason to believe, not homogeneous in early times, and it is possible that the Jutes, properly so called, may have migrated with their families, in separate bodies like their neighbours the Angles. If so, this would go far to account for the perpetuation of the peculiarities of the people in this country.

In London, as might be expected from the near neighbourhood of Kent, Jutish faces may occasionally be met with in the streets.

It would be interesting to ascertain if the type exists on the East Coast of Scotland, or in the North of England.

APRIL 24TH, 1883.

Professor W. H. FLOWER, LL.D., F.R.S., *President, in the Chair.*

The Minutes of the last meeting were read and confirmed.

The following presents were announced, and thanks voted to the respective donors:—

FOR THE LIBRARY.

From the LISBON GEOGRAPHICAL SOCIETY.—Portugal and the Congo.
From the GERMAN ANTHROPOLOGICAL SOCIETY.—Correspondenz Blatt. March and April, 1883.
From the LIBRARIAN.—Report of the Mitchell Library, Glasgow, 1882.
From the AUTHOR.—Darwin and Modern Evolution. By Raphael Meldola.
—— On Philography. By Andreas Gottschling.
—— Ethnologische Forschungen und Studien. By Dr. Fligier.
From the ASSOCIATION.—Report of the British Association, 1882.
—— Journal of the East India Association. Vol. XV, No. 1.
From the SOCIETY.—Proceedings of the Royal Geographical Society. April, 1883.
—— Mittheilungen der Anthropologischen Gesellschaft in Wien. XII, Band. Hefte 3, 4.
—— Proceedings of the Royal Society. No. 224.
—— Bulletin de la Société de Borda, Dax. No. 1, 1883.
—— Journal of the Society of Arts. Nos. 1585–1587.
From the EDITOR.—Australasian Medical Gazette. No. 17.
—— Revue Scientifique. Tom. XXXI, Nos. 14–16.
—— Revue Politique et Littéraire. Tom. XXXI, Nos. 14–16.
—— Revue d'Anthropologie. No. 2, 1883.
—— "Nature." Nos. 701–703.

The election of CHARLES ROBERTS, Esq., F.R.C.S., was announced.

The following paper was read by the author:—

On the MECHANICAL METHODS *of the* ANCIENT EGYPTIANS.

By W. M. FLINDERS PETRIE, Esq.

[WITH PLATE II.]

THOUGH so much labour has been bestowed on the literary remains of the Egyptians, and there are now so many scholars who can read an inscription with ease, yet not a single student

appears to have given his attention to the mechanical evidences of ancient knowledgeand skill. Beyond cursory remarks on the wall paintings that show technical subjects—such remarks as any intelligent traveller might make—nothing has been written on the methods by which such marvellous results of skill and labour were produced. The latest writer—Brugsch, in his "History of Egypt"—says of the great diorite statue of Khafra, "Unacquainted with the hardness of steel, and the marvellous action of those instruments which in our day scarcely allow the artist to feel the trouble of rough work, that primitive race knew how to conquer the resistance of the hard stone, and to animate a lifeless mass with the spirit and expression of life. No master of modern times is capable of giving an answer to the question, how they managed to overcome the difficulties of the unyielding substance" (vol. i, p. 97, English edition). Such then is our present lack of knowledge on the subject; and it was a question of special interest to me, while living at Gizeh, surrounded by the finest examples of architecture and masonry, to obtain such information and collect such specimens as might help to answer this most interesting inquiry. Most of the illustrations of work here exhibited or described are drawn from the earliest sources, the pyramids, temples, and tombs, of the fourth dynasty, constructed some time before 2400 B.C.; and later works are only quoted as additional instances of methods already known in the earlier times.

The principal result of the examination of these remains is the discovery that the stone cutting was performed by means of graving points far harder than the material to be cut; and that as the stones operated on were quartz, or mixtures containing quartz, the graving points must have been therefore of some jewel harder than quartz; since no metal, not even the hardest tempered steel, or osmiridium, is capable of cutting quartz, apart from a mere bruising action. These cutting points are found to have been bedded in a basis of bronze, in order to hold them in the right position, and move them with the requisite force.

This essential principle—that the cutting action was not by grinding with a powder, as in a lapidary's wheel, but by graving with a fixed point, as in a planing machine—must be clearly settled before any sound ideas of the methods or materials can be arrived at; and I would therefore first of all direct your attention to those examples which give the most distinct evidence on this point.

First, we have a circular piece of granite, grooved round and round by a graving point; the grooves here are continuous, forming a spiral; and in one part a single groove may be traced around the piece for the length of five rotations, equal to 3 feet;

even at the ends of this groove there is no sensible difference in its character, as if the cutting point had begun to fail; but merely owing to irregular action of the tool, the grooves become confused and cannot be individually traced further.

Another piece is part of a drill hole in diorite. This has been part of a hole $4\frac{1}{2}$ inches diameter, or 14 inches circumference; as seventeen equi-distant grooves appear to be due to successive rotations of the same cutting point, we have here a single cut 20 feet in length.

Another piece of diorite shows a series of grooves, each ploughed out to a depth of over $\frac{1}{100}$ inch at a single cut, without any irregularity or starting of the tool.

Other pieces of diorite show similarly the regular equi-distant grooves of the saw, repeated in a manner which proves that the graving point travelled for at least many yards through the material, without any appreciable alteration in its sharpness.

Collateral evidence is also given by two pieces of diorite bowls with portions of inscriptions. These hieroglyphs are evidently chased with a cut of a graving point, and are neither scraped out by repeated rubbings, nor ground out by a wheel; these specimens bear, one the name of Senofru, the earliest king of whom any remains are known, and the other the standard of Khufu, his successor, and builder of the Great Pyramid. Both are undoubtedly genuine fragments, as I picked them up from the vast number of such chips which strew the ground at Gizeh.

Now looking at these examples of work,—at the depth of the grooves graved out by a single point, and the enormous strain thrown on a cutting edge in ploughing out $\frac{1}{100}$ inch thick of quartz at a single cut,—and looking to the length of the grooves produced by a single point, which cut through at least many yards of quartz without any appreciable wear, it may be safely said (after examining specimens of modern work in such materials) that it is impossible for such results to have been produced by any means, except by jewel points far harder than quartz, set in a bed so that every point shall individually do its work in ploughing out the material. Another evidence of this is seen on the granite core; there the cutting point, which can be traced, has passed through quartz, felspar, hornblende, and mica, without the least interruption; and when we consider the strain thrown on a cutting point in suddenly passing from a soft material to a patch of far harder nature, it is evident that not only must the separate cutting points have been each fixed in rigid setting, but that the setting must have been made with great skill and care to prevent the stones from being wrenched out of it, or crushed in it, by the sudden strain.

If examples of work done by any grinding process be examined, it will be seen that there is not a trace of the definite grooves such as we see here. On modern lapidaries' work, done by a wheel fed with loose diamond powder, numerous shifts in the plane of the cut may be seen, showing the outline of the wheel; but no grooves or definite ploughings in the material, produced by individual points of diamond. Similarly on the tubular drillings done with soft iron and sand by the Chinese, or the work of many other nations who are accustomed to cut stones by means of a soft metal fed with a harder powder,—on none of these that I have ever seen is there any trace of ploughing out of the material; and, indeed, it seems physically impossible that any particle of a loose powder could become so imbedded in a soft metal by the mere accidents of rubbing that it could bear the immense strain, probably of some hundredweights, needed to plough out a groove of any considerable depth in such a hard material as quartz.

This systematic use of jewel points set in some basis may therefore be considered as proved by the existing work; and from finding that the loose sand left in a cut (and also the sides of some of the cuts) are stained green, we may conclude that the metal of the setting was bronze.

What the jewels were that the Egyptians used for these stone-cutting tools is not yet known. In some of the dust left in a saw-cut, perhaps some recognisable chips might be found. Indeed, I picked out one microscopic chip, with which I scratched a quartz crystal easily. But Professor Maskelyne has not succeeded by chemical separation in obtaining any recognisable fragments. The range of possible materials is limited to but five minerals: beryl or emerald, topaz, chrysoberyl, sapphire, and diamond. Of these I have experimented with beryl and sapphire, and the deepest scratches that I could make with either of these stones on diorite are barely perceptible, not $\frac{1}{10}$ of the depth of ancient cuts on the same piece. With greater pressure the edges of the jewels crushed and crumbled without making any deeper cut. My own conclusion, therefore, is in favour of diamond having been used, though the evidence is not distinct enough to press such an opinion. Diamond is not known as a gem in Egyptian antiquities until Græco-Roman times; but as it is colourless and unpolishable, there would be nothing to recommend it to Egyptian taste, which always chose the brightest colours. Hence it might be known as a stone for use, though not for ornament; and I understand from Mr. Boscawen, that the early Babylonian inscriptions mention the "piercing stone," a name known to be employed for the diamond in later times; so that the very early

statues in diorite lately found in Babylonia, which are of the finest work (like the splendid diorite work of the earliest Egyptians) may have been very possibly graved with diamond.

Next we will consider the forms of the tools used. The simplest tool of all was the straight bronze saw, set with jewels. This must have been in some instances over 8 feet in length, since the grooves run lengthways on the side of the Great Pyramid coffer, which is 7 feet 6 inches long, and some length of stroke must also be allowed for. The thickness of the saw naturally varied with the magnitude of the work. For the heaviest work, as on large blocks of basalt, the saw was $\frac{2}{10}$ inch wide; on a piece of statuary work in syenite it seems to have been ·14 inch wide; and on a small syenite trinket it was not more than ·03 inch wide. There are several examples of sawing here in grey syenite, casts from red granite, in diorite, in basalt, and in limestone. The granite coffins of the Great and Second Pyramids both retain traces of their having been sawn into shape on the outside; and Howard Vyse reports the same of the basalt coffin of the Third Pyramid, unhappily lost at sea. The largest work of sawing that I have seen in the great basalt pavement, on the east of the Great Pyramid, 1,800 square yards in area, and containing a somewhat larger number of blocks; all these blocks appear to have been sawn, and were finely finished off on the upper surface. Probably the casing blocks of the pyramids were also sawn, as I have found many slices of sawn limestone lying about; but the blocks were all pick-dressed afterwards, so that no sawing marks remain on them. It is difficult to be certain of the age of sawn limestone, as the Arabs doubtless sawed limestone freely when cutting up the casing for Sultan Hassan's mosque; but the examples of limestone here, from their locality or condition, are certainly ancient.

Another form of saw, of which there is but one proof, is a circular saw; this must have been $6\frac{1}{2}$ inches diameter, used for slicing small pieces of diorite. The marks produced by the most prominent cutting point at one side of the edge of it still remain on one face of the piece of diorite here, though the surface has been polished. It has been suggested that these marks are due to a series of jewels set on a flat rotating face, for planing down the flat bottom of a dish; but, besides the facts that no flat-bottomed dishes are known, and that the polishing lines cross the surface in all directions, it would need far greater skill to set a row of stones on a face to so exactly the same level as to make such marks, than to set them on an edge for slicing. So the simplest explanation of this piece is that a circular saw was used.

Though sawing was thus freely used for cutting the outsides

of the great granite and basalt coffins, some other means were requisite for hollowing the insides of such vessels. Here the inventive genius of the fourth dynasty exactly anticipated modern devices, by adopting tubular drills, as the readiest and cleanest way of removing material with the least waste of force. These tubular drills varied much in diameter, thickness, and length. The smallest is one used in alabaster only ·24 inch diameter, and ·02 inch thick. Other examples of small cores in alabaster vary up to ·52 inch diameter; a beautiful example of a mortar, the hollowing which had been begun with a tube drill, and which had been broken and thrown away, shows a drill ·7 inch outside diameter and probably ·04 inch wide. A hole in a basalt vessel is 1·8 inch diameter. A core in limestone shows a hole 1·9 inch diameter. A tubular drill hole in a lintel of the granite temple of Khafra, at Gizeh, is 2·2 inches diameter, and the thickness of the drill ·1 inch at the end: this is a particularly brilliant illustration of the form of the drill, as the core being in a tough patch of hornblende in the syenite would not break out, and hence a stump ·8 inch long still remains in the hole. This is the S. pivot hole of the doorway leading to the chamber with niches. The fine granite core, on which continuous grooves can be traced, is 2·2 inches diameter; it was found at Gizeh, and is probably of the fourth dynasty. Pieces of alabaster cores from Gizeh are 2·5 and 2·8 inches diameter; and one of them shows the interference of the side of another drill hole cutting into it. The drill used in hollowing out the granite coffin in the Great Pyramid was 4·2 inches diameter, as we find by two places in which the drill was allowed to run too deep into the side; and as the bottoms of these holes are 7·7 and 8·4 inches below the top of the block, this probably shows the length of the drill used to be about two diameters. A piece of granite coffin here has a trace of a drill hole 6·6 inches long. A piece of greenstone waste was found with traces of three drill holes upon it, each 4·5 inches diameter; this is a very interesting piece, as it is one of the class of rude stone implements found at Gizeh; from other examples I had concluded these to be all of Ptolemaic times, and this specimen effectually prevents their being attributed to a pre-pyramid period. Two holes conjoined, in limestone, are 4·8 inches diameter, and show how closely holes were placed together for hollowing out masses; these drill holes must have just overlapped by about the thickness of the drill, so that the greatest economy of labour was attained by using as much of the previous cut as possible, without scooping out any of the core of the previous hole. A piece of diorite waste shows a hole 4·8 inches diameter, with remarkably clean cut grooves ploughed out by the outermost cutting point.

Besides all these hand specimens, there is at El Bersheh a case on a far larger scale; unfortunately many things to be examined there, in a short hour or two, left me no time to examine this carefully. The rock there required to be largely cut away to afford a platform in front of some tombs of the twelfth dynasty; and all over the platform the surface is apparently covered with the circular grooves of large tubular drills about 18 inches diameter. I cleared the rubbish out of one of the grooves, and found that it had a smooth bottom, and was ploughed out by continuous motion, and not chipped; this cutting might be supposed to result from trimming out drums of columns in the rock; but the surfaces inside as well as outside the circular grooves were rough broken, and not sawn across, and in one place I found the grooves actually intersecting, where it was not required to remove the full size of a drill hole. Hence it seems almost certain that the tubular drill principle, of which examples are here before us, from ¼ inch to nearly 5 inches in diameter, was carried on still further into sizes suitable for removing rock on a large scale,—sizes which must have needed several men to turn the capstan head of the drill. Other examples of tubular drilling I have observed on the ornamentation of the alabaster of the palace of Rameses III at Tel el Yahondiyeh, of the twentieth dynasty, in the British Museum; and on the great diorite statue of Khafra of the fourth dynasty, found at Gizeh: on the latter there is the end of a tube drill hole, 1·5 inch diameter, just between the feet, showing that the space between the legs had been roughed out by running a drill hole down there. Tube drills were also in constant use for beginning the hollowing out of the great diorite bowls, to remove the material from the axis more quickly and easily than could be done by turning on the lathe alone; the proof of this is seen in the circular groove in the inside of most of these bowls; it is here seen in a piece of black diorite bowl from Sakhara, and in a piece of white diorite bowl from Gizeh. It might be thought that this line was only an ornament, and on some examples it is clearly an added ornament, as it is graved out irregularly; but the type originated in the bottom of the drill hole not having been cut away in turning the bowl, as may be seen on the piece from Gizeh, where the groove clearly does not belong to the same centering as the turning, but falls off altogether into the regular curve on one side. These tube drill holes were also used in hollowing more upright vessels, as may be seen from the bottom of a drill hole showing in the portions of turned basalt and alabaster cups of the pyramid period from Gizeh. Probably the vases, which have a hole through the bottom for ease of turning out the hollow, afterwards

plugged up, were begun in the rough with a tube drill hole right through the block.

A peculiar feature of all the cores and holes made by these tubular drills is a certain amount of tapering always to be found. This tapering cannot have been produced by the mere rubbing of the side of the drill in turning round in the hole, since, not only would such a cause be quite inadequate, but the grooves ploughed out by the cutting points are just as distinct on the sides of the hole or core where it is tapered, as at the lower part. Hence it seems that not only did the Egyptians set cutting jewels round the edge of the drill tube, as in our modern diamond crown drills, but that they also set cutting stones in the sides of the tube, both inside and out. Thus the hole was continually rimered larger by the tool, and the core turned down smaller, as the cutting proceeded; and this enabled the tool to be withdrawn the more readily from the groove, as the space is thus wider at the top than it is at the bottom.

Other drills, not tubular, were used for very small holes, such as those in the symbolic eyes here, which are drilled in syenite, 1·2 inch long, though only ·08 inch diameter.

A point that should be noticed in the use both of saws and of tubular drills is the immense pressure that must have been applied to make the cutting points bite so deeply into the stone, and cut the stuff away so rapidly. The grooves $\frac{1}{100}$ inch deep in quartz must need a pressure on the point of much over a hundredweight; since a pressure of about 10 lbs. does not cut scratches $\frac{1}{10}$ of the depth of these, to say nothing of the material removed in the breadth of the groove. If, then, each cutting point on the saw or drill had a pressure on it of a hundredweight at the very least, and there were probably at least ten points occupied in making the whole breadth of the cut of the saw, this would show that the minimum pressure of at least half a ton must have been applied; and it would seem more likely that two or three tons would be the working load on one of the 4-inch drills cutting in granite. What, also, shows this enormous pressure is the rapidity with which the tool sunk into the stone. We do not know the length of stroke of the saw, but in a drill hole, or still better on a drill core, the exact length of stroke can be seen. On the granite core here the grooves are a double spiral, showing that they were made by two stones on opposite sides of the tube; and the pitch of the thread is $\frac{1}{12}$ inch, the circumference of the core under 7 inches, and therefore the rate of sinking the cutting was $\frac{1}{840}$ of the distance travelled by the tool. If we only imagine sawing a block of wood 7 inches thick, cut with a saw making 1-foot strokes, it would be thought quick work to cut

down 1 inch in seven strokes in any but the softest wood. Yet this is the Egyptian rate of cutting, or tearing through, the hardest blocks of stone known, diorite and granite. The wonder is how any bronze tube or saw-blade could bear the requisite pressure without doubling up, and how the jewels could be set in any sockets to support them against such a violent drag.

Not only was a rotating tool employed, but the further idea of rotating the work and fixing the tool was also familiar to the earliest Egyptians. The fragments of bowls turned in diorite, which are here, will show this. One piece of the bottom of a bowl shows the characteristic mark of turning; not only are there the circular grooves of the tool (showing it to have been a jewel point, as on the saws and drills), but also the mark of two different centerings: this shows that the work was knocked off its centre by the force of turning, and afterwards reset; in such a case it is impossible to hit the old centering accurately, and we have here that trouble, that every turner knows so well, of the cuts on the new centering not running smoothly into the others, but meeting at an awkward break in the surface, and so forming a cusp of the curves on the two different centres. Other specimens of turning in black granite, basalt, and alabaster, all of the pyramid period, are also here. The finest examples of turning in hard stone are in the British Museum. A small, highly polished, narrow-necked vase in diorite, or rather in transparent quartz, with veins of hornblende, has its neck only ·05 inch thick. A large vase of syenite is turned, inside and out, remarkably thin, considering the size of the component crystals. But the greatest triumph is a bowl of diorite (No. 4716), translucent and full of minute flaws, which must render it very brittle; yet this bowl, 6 inches diameter, is only $\frac{1}{40}$ inch (·024) thick over its greatest part; just around the edge it is thicker, in order to strengthen it, but a small chip broken out of the body of it shows its extraordinary thinness, no stouter than thin card. An alabaster vase, of Unas of the fifth dynasty, almost rivals this in thinness, being only $\frac{1}{20}$ to $\frac{1}{30}$ inch thick; but the softness of the material makes it of far less interest. A very favourite plan for narrow-necked vessels was to turn them in two or three parts, and join them together, sometimes finishing off the inside on a fresh centering on the lathe. For this finishing, and also for hollowing out vessels in one piece, a hook tool must have been used. The brown limestone vase here is an example of this. This vase, and also the alabaster vase here, are probably of Greek date: the alabaster is of a minimum thickness of ·07 inch in the neck and ·12 inch in the body. Both these vases illustrate the curious idea of employing turning to hollow out a uniform inside, while the outside

was finished by hand. The reason of this where a handle had to be left in cutting is obvious, but this system seems strange in vases with uniform circular outsides. The familiarity of the Egyptians with turning in later times is shown on the abundant copper coinage of the Ptolemies; every blank has been turned after its casting, to leave a clean face for striking; the two centre punch marks may be seen on every coin, and on many specimens (such as those here) the marks of the turning are also visible.

For the use of a hook tool in turning the insides of vases, a very rigid rest, or even a mechanical tool-holder, is almost necessary; but one specimen here shows that the early Egyptians were already familiar, not only with lathes and jewelled turning tools, but with mechanical tool rests, and sweeping regular arcs in cutting. The diorite bowl, of which this piece is a fragment, has been turned as a segment of a sphere inside, by a tool working from a fixed centre in the axis of the lathe, with a radius of 3·94 inches. Having cut this spherical curve, the centre of play of the tool was shifted about ·5 inch higher, and ·7 inch out of the lathe axis; and a fresh arc was struck from this centre on the bowl, thereby cutting out a fresh curve which left a raised lip around the edge. The proofs of this explanation of the process are found in the exact equality of the two curves—that of the bowl in general, and that under the lip—in the fact of the principal surface exactly falling in with the inner edge of the lip, in the fact of the true circularity of the section of these curves, and in the cusp formed where they meet, an awkwardness which no hand-turner could ever take the trouble to make, but which necessarily results from a sudden change in the centre of the arc of the tool. All these details have been worked out from very careful measurements of this piece, using successive templates of slightly varying curves, to measure the exact curvature, &c.

For the intricate work of the statuary, the straight lines and uniform curves of saws and drills are only available in roughing out the work. The statue in diorite of King Khafra shows us some further details; where the legs join the front of the throne there is a groove running along the irregular curve of the calf of the leg—a groove which has been cut too deep into the throne, and left as a mistake. This shows that a hand-graving toolwas used to score out the varying curves of the limbs in the block, and so to detach a layer or coat of stone from off the intended form of the figure. This is a process worthy of the men who hollowed out their granite coffins, by rows of tube drill holes; like a modern carpenter's hollowing a block of wood, by centre-bit holes. The effect of this same graving tool, worked by hand,

is seen between the fingers and toes of the figure; the grooves it cut are ·15 inch wide, and are often run too deeply into the stone, thus revealing the method. Much of the work was hammer-dressed and then polished down; the hieroglyphs are apparently all done by picking, though in small hieroglyphs, as we have seen, a graving point was used to cut the lines.

Before leaving the question of the forms of tools, we may note that in the tombs of the fourth and fifth dynasties carpenters are represented using saws (always curved along the cutting edge), mallets, and chisels, two forms of adzes, and the bow-drill. Their hands always grasp tools with a clench of the whole hand, and not between thumb and finger, although the scribes always hold a pen as we do.

Besides sawing, hammer-dressing was largely used; and in some cases (as in the King's Chamber and Antechamber of the Great Pyramid) the saw was used to mark out the work; grooves were cut about half an inch deep around a block, and then the hammer-dresser was left to trim it down to the plane of the grooves. Also on sawn blocks, the surfaces to be placed in contact were usually hammer-dressed, to leave sufficient space to hold the cement, while just around the edges of the surfaces they were left quite smooth. Hence the stones would be in contact, and the joint quite microscopical on the outside, while there was a fair thickness of cement on extremely roughened surfaces inside the joint. This may be seen here on two specimens of basalt, and one of diorite.

For dressing surfaces truly flat, the regular custom of the workmen was to use a trial plate, or facing plate, prepared as a true plane, and smeared with red ochre. Wherever the ochre came off on the stone, they knew that there was an excess, and accordingly picked it away. The tool used appears to have been a sort of small adze, with which the stone was sliced down, very delicately and regularly, by hand. All the blocks of the Great Pyramid casing were prepared with these facing plates, as may be seen by the remaining touches of ochre on all the prominent points. Not only on building stones, but on rock dressing the same ochreing is visible; on the floor of the south-west socket of the great pyramid, and also on the sides of rock tombs. Where the stone was much larger than the facing plate, as was the block of granite over the King's Chamber doorway, about 8 feet × 12 feet in area, there a diagonal draft was cut along the stone, from corner to corner, and thus any wind in the plane of the face was avoided.

In the existing casing stones, the average thickness of the joints, 6 feet in length and 35 square feet in area, is only $\frac{1}{50}$ inch; and this shows that the straightness and squareness

of the surfaces must be true to $\frac{1}{100}$ inch on an average. The levelling of the stones is equally fine, the average variation being only $\frac{1}{50}$ inch over about 100 square feet area, and only differing $\frac{1}{50}$ inch at a distance of 40 feet. Such results could not be obtained by plumb-line and square, and it is only by water-levelling on still days that such accuracy could be realised. In a painting at Thebes, the workmen are apparently shown chiselling down a plane face to a stone; they have a string stretched quite clear of the stone, over two offset blocks, one at each side, and on their applying an offset piece to the face of the stone they see whether the face is in excess; this is a beautiful method of work, as the excess does not bulge out the string, but can be exactly measured as they proceed, and also the string is not removed while working, as the chisel can be used beneath it, and so each stroke can be quickly tested as they proceed. The face on which they work is placed vertical, so that no bellying of the string will cause inaccuracy. The string is applied both diagonally and parallel to the sides, so as to observe any winding in the plane.

In the use of plaster the Egyptians were very free. This is shown in the flaws in the pillars of the granite temple, in the roof of the King's Chamber, and the Antechamber in the Great Pyramid, and in the granite passage of the Second Pyramid; all these are filled with plaster, which is tinted red, so that it should not show. The plaster is often, perhaps generally, laid on with the fingers; the grain of the skin even can be seen on plastering in the angle of the King's Chamber roof; but the flat surfaces were smoothed by a flat tool. The great freedom in the use of plaster probably arose from the necessity of using it to fill the flaws in the rock-cut tombs: a large flaw was usually cut smooth, and filled in with blocks of stone inserted; but smaller flaws were filled with plaster, often of far greater durability than the stone itself, some of the hieroglyphs on plaster in the tombs at Giseh being as sharp as when first moulded.

For marking out their work the Egyptians generally used red ochre paint; just such as is daubed on all the boxes sent by railway at this day, in lieu of paper labels. In cutting a passage in the rock, a rough driftway was first run: the roof of it was trimmed, an axial line in red was marked on the roof, and the sides trimmed to gauge from the axial line. On the sides of the forty-three granite beams (averaging 50 tons weight each), which roof the King's Chamber, and the spaces above that, the workmen's lines may be seen marked in red about $\frac{1}{2}$ inch wide; these are usually—(1) a line at some definite distance from the dressed face, from which the dressing was gauged; (2) a mid-line at half the length of the beam; (3) a line near each end

showing where it should be placed on the supporting walls; (4) a line 1 cubit from each end, by which the lines of support could be measured off in case they were defaced; and (5) smaller lines in black, about $\frac{1}{10}$ inch wide, marked on the red in some parts, to give more definite points of reference. Thus we see that, besides marking out the work in the usual modern way, the workmen were careful to supply lines which were not to be cut away or hidden in course of work; from which offsets could be taken, so as to see that they had not overshot the mark in their cutting or placing of the stones. In lining a rock-tomb with fine stone, each course was not gauged to uniform thickness before it was built in; but after laying it, a red line, at the level of the top of the lowest stone, was run around the chamber, to mark where the dressing down was to take place.

In laying the rough stones of the mass of the masonry of the pyramids one on the other, a very curious system was adopted of sinking the irregularities of the stones of each course into those of the course below them; thus each course bears on it a sort of plan, sunk on it to different levels, showing all the stones that come above it. This was also the arrangement in fitting masonry on a rock-bed, as in laying the causeway of the granite temple, and in fitting fine lining of granite, limestone, &c., against a wall of megalithic blocks.

For such a system to be carried out in pyramid building, it became requisite to plan all the courses on the ground before they were carried up and built into place; and this was certainly the method, as on all the blocks of casing stone may be seen lines showing where the edge of the stone above it was to come; the meaning of these lines may be seen on the blocks of core masonry, where they will be found always to mark the edge of the superincumbent stone. The same planning of the work also took place for all the internal chambers, as on the roofing blocks of the highest space over the King's Chamber may be seen many of the numbers of the blocks in consecutive order. The casing of the pyramid was cut to angle before it was built in, as there is a difference of 4′, or ·09 inch on their length, in two adjacent blocks. In the Third Pyramid the granite casing has been left in the rough on the face, to be dressed down afterwards; so the rule on this point does not appear constant.

The method of fine dressing all the limestone was not by grinding, but by very careful picking, as if with a small adze; this enabled the flatness of the work to be tested by the trial-planes as it went on; and the usual standard of flatness appears to have been that no space more than a couple of inches across should miss touching the true plane, within the thickness of the smear of ochre; usually the ochreing is found on points not

over an inch apart. The surfaces of the chambers of the pyramids, which are built of limestone, were probably finished off after building, as on the walls of the gallery pickmarks of the dressing may be seen across a joint. In the granite temple the stones were apparently built with a rough excess left on the face, like that on the granite casing of the Third Pyramid, only 1 or 2 inches thick in place of 6 or 8 inches. This excess was afterwards dressed away in finishing the face, as then was produced the curious appearance of each stone running a little way round the corner of the chamber, or the corner being cut out in the solid stone.

On the methods of quarrying I can only speak of limestone, as I had not the advantage of seeing the sandstone or granite quarries. At the great quarries of Turra and Masara, on the opposite side of the Nile to the pyramids, there was a regular system of work. A square gallery was run into a good stratum of rock, the gallery being about 20 feet square. Similar galleries were run parallel with each other, leaving an equal space of rock between them; then cross galleries were cut, and so the whole space was reduced to an enormous hall, 300 or 400 feet wide, the roof of which was supported by rows of pillars about 20 feet apart, and each 20 feet square. Disused parts of the hall were filled up with the waste chips. Such halls do not necessarily show on the outside of the cliff, as they may have but a single opening, and be almost entirely in darkness inside. To excavate these regular galleries, the workman—cutting a row of foot-holes, by which to ascend to the top of the gallery—there excavated a recess the width of the gallery, the depth back of the one block of stone to be removed, and high enough for him to lie upon. Then cutting a groove downward behind the intended block, while others cut grooves horizontally inwards from the face, and vertically along the gallery sides, the block was at length liberated from the rock, and ready to be removed on an ox sledge down the causeways, which descended to the plain below. For merely hollowing away rock which was not required for use, grooves were cut wide enough to stand in, and then cross grooves, by which at length the blocks could be broken out. This is seen in the subterranean chamber of the Great Pyramid, and the cutting around the Second Pyramid. In the open-air quarries at Nezlet esh Shekh Hassan, the system was rather different. There the fissures in the limestone were untouched, as the sides of them were inferior stone; and the quarrymen actually left all the fissures, as it were, enclosed in a wall of rock, standing like a honeycomb all over the hill. It is possible to walk a long way on the tops of the fissure-walls, looking down into the workings 20 or 30 feet below. They

even cut foot-holes to descend into a space where good stone could be obtained, and must have hauled up the blocks out of the pit they excavated, until the approach of other pits, and workings between the fissures, enabled them to cut a gap about 6 feet wide, straight down the fissure-wall, and so get easy access to the bottom of the place which they had sunk to such a depth.

Granite was, in the pyramid times, often obtained from boulders taken from the bed of the Nile: all the casing of the Third Pyramid, and some stones in the Great Pyramid, showing this. But other and larger pieces, such as the beams over the King's Chamber, and over the granite chamber in the Third Pyramid, were quarried; and in order to determine the plane of fracture, not only was a groove cut along the surface, but holes were roughly drilled at every couple of feet right through the mass; the halves of these holes on the tops of the blocks may still be seen.

For moving the stones readily, without bruising their edges, lugs were left projecting from the surface, which was otherwise dressed flat; these lugs were knocked off after the stone was in its place, and the remainder of the surface was polished down. They may be found remaining on the walls of the spaces over the King's Chamber, and their traces may be found on the walls of the chamber itself. A cast of one shallow lug, from the granite leaf in the Antechamber, is before you; and I picked up a large broken-off lug on the hill of Gizeh. Another plan, when the block was not yet faced down, as on the granite casing of the Third Pyramid, was to cut hollows in the rough excess of the stone, to get the ends of levers under it; hollows were also cut in the lower edges of rough backing stones, as in those of the Mastaba el Firaun of King Unas at Sakkara.

The method of raising such immense blocks is not known, except by inference. Considering that undoubtedly the easiest way would be by rocking the block, and so alternately raising two piles near the middle of it, and that Herodotus says that machines composed of short pieces of wood were used, there is little reason to doubt this explanation given by Howard Vyse. But something beyond brute force was employed, as, for instance, in placing the lower granite portcullis of the Second Pyramid; there a block, which would need forty or sixty men to lift it, was slid on its edge along a passage only $3\frac{1}{2}$ feet wide; and then slewed round in a complex way, so as to turn it up into the grooves prepared in the rock for it to slide in. Not more than four men could well work at it, and they in a cramped space; and hence some great advantage of leverage, skilfully applied, must have been available.

Finally we will briefly notice the system of organisation that appears to have been required in the enormous works of the Egyptians. The prodigality of labour shown in their buildings has often drawn reproaches on their inhumanity and folly, from modern writers who have never lived in the country. But to any one who sees that during a quarter or a third of the year all agricultural labour is absolutely at an end, by reason of the inundation, and that the modern people merely idle away their time in enforced business, it may rather seem that to organise and train a small proportion of the effective labourers of the country in regular work during that time was really a great benefit to the national character. To require a man every six years to serve on the public works, during the season when he could do nothing else, would certainly not be a great hardship, and such a system of levying would suffice to build the Great Pyramid entirely in the twenty years which Herodotus states, without anything beyond easy, steady labour. When we consider that all the transportation of stone for the great buildings which cover Egypt must have been done during the season of High Nile, when water-carriage was to be had directly from the quarries to the site on the margin of the desert, the special utility of labour on such works during the inundation is plain. And we have an historical notice of this system by Herodotus who states that the levies for the building of the Great Pyramid only worked for three months at a time. Thus it was by the natural and obvious system of employing a fraction of the population, during the season when all ordinary labour was at a standstill, that the Egyptians were so readily able to command such an immense amount of force as was requisite to carry out their great conceptions.

Postscript.

In consequence of the remarks made on the granite core, I have examined it more carefully. It offers apparently a complete proof that the lines were cut by fixed points, and not by the rubbing of a loose powder; for the grooves are cut as deeply in the quartz as in the felspar. And the felspar being somewhat rubbed down, by general friction, the lines are actually cut through a greater thickness in the harder quartz, which stands above the felspar. Now no loose powder could cut down exactly to the same depth in materials different in hardness, like quartz and felspar; still less would it cut more out of the slightly more prominent quartz; but a fixed point must cut to the same depth in each material.

The spiral was described as a "drunk screw"; I therefore traced very carefully a normal plane, at right angles to its axis,

and measured off the distances to the spiral: they are thus, at successive quarter turns, in inches:—

	Quarter turns.				First repeated.
Turn 1 ..	3·14	3·11	3·07	3·08	3·06
„ 2 ..	3·06	3·03	2·99	2·97	2·95
„ 3 ..	2·95	2·94	2·91	2·87	2·83
„ 4 ..	2·83	2·82	2·80	2·77	2·76
Mean	2·995	2·975	2·942	2·922	2·900

Here, if there were any "drink" in the screw, it would appear as an irregularity in the order of the means of such quarter; whereas they proceed as regularly as the small variations due to texture, will permit. There is not $\frac{1}{100}$ inch irregularity in the mean spiral, though the pitch is $\frac{1}{10}$ inch.

The spiral could not be produced by the mere withdrawal of the tool, as it is too deeply cut to have been made without great force; and it is wholly unlikely that a tool should be withdrawn with such regularity. Again, as there would be from $\frac{1}{10}$ to $\frac{2}{10}$ inch of loose dust between the tool and the tapered end of the core, the cutting points of the crown would not reach it in withdrawal; and if they did so accidentally they would not touch the core in a continuous line all round, but only on one side.

That there are lines on modern drill cores is not to the point. Those cores are not tapered, and hence the lines can there be produced by the crown.

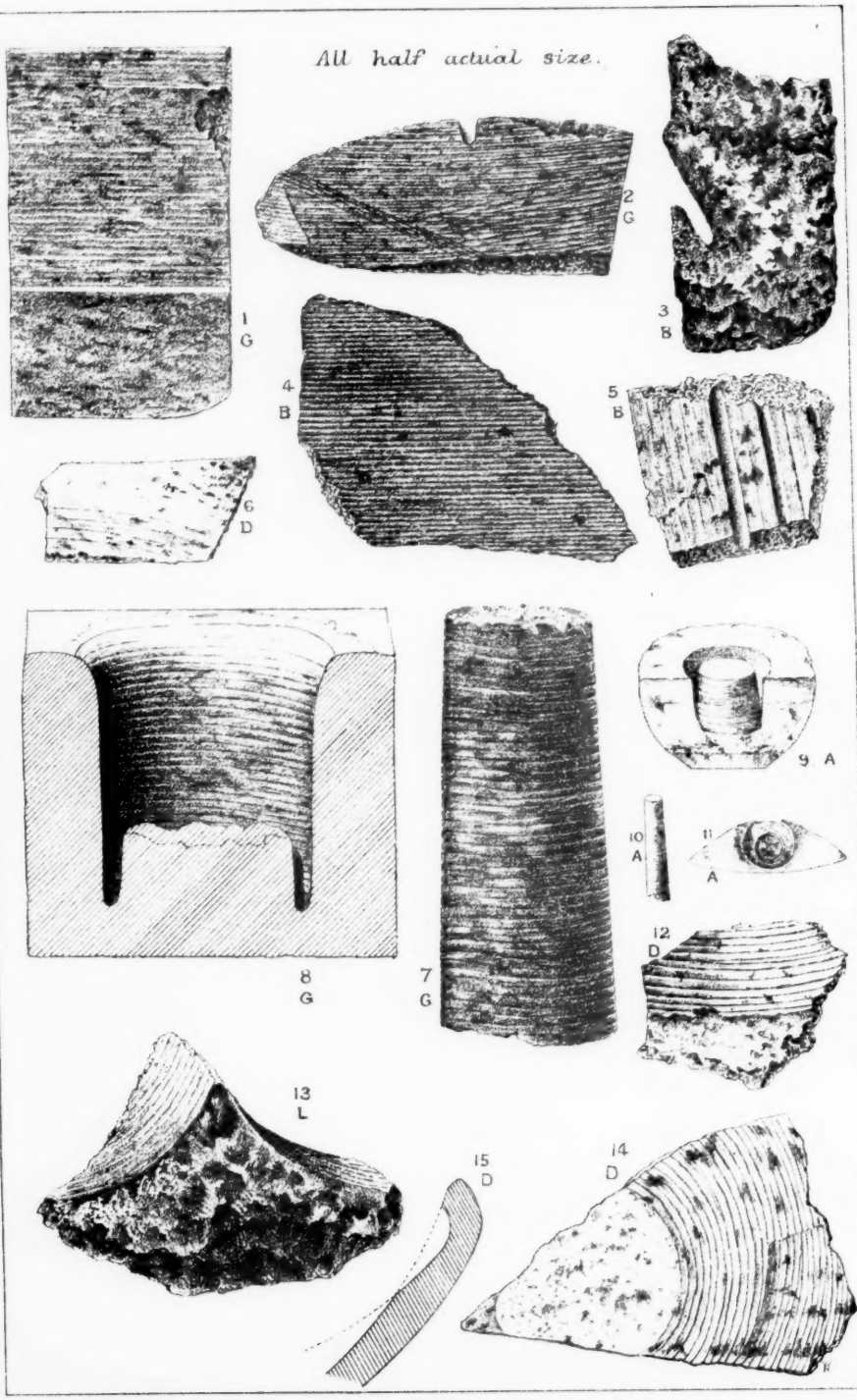
On examination it seems most probable to me that the coning was not due to stones set with different projections from the drill side, but rather by a row of stones up the side projecting uniformly. Then when the top weight was tilted over to one side, or did not balance truly on the drill head, it would drag the drill over, and thus make it enlarge the hole and taper the core, as it cut downwards.

An engineer present has remarked to me that the manufacture of hammers good enough to dress down granite on such a very large scale, as in the Great and Third Pyramids, implies almost as much skill as any other method of dressing the stones.

The result, then, of a much closer examination of the specimens, is to confirm the conclusions as to the method and quickness of working stated in this paper.

The diorite statues of Goudea (before 1500 B.C.), lately brought from Chaldea to the Louvre by M. de Sarzec, show traces of being

EARLY EGYPTIAN STONE CUTTING



A. *Alabaster.* B. *Basalt* D. *Diorite.* G. *Granite.* L. *Limestone*

wrought by similar tools to those here described. Between the feet of the largest statue are the bottoms of four tube drill holes 1½ inch diameter; the groove is $\frac{1}{20}$ inch wide, and the core still projects about ·08 in one hole. On another statue are five tube drill holes, ·8 inch diameter, with grooves $\frac{1}{30}$ inch wide. There are no traces of lines on the sides of the holes, so they might have been done by a loose powder; but on a diorite fragment in one of the cases are very regular equidistant lines, which, though but slight, are yet far too uniform and sharply cut not to have been made by fixed points regularly advancing, as in tubular and drill work. There is also a piece of a well-turned bowl in lime-stone. Hand-graving tools were largely employed on the figures; the long inscriptions, the fringe of the garments, the divisions on the architect's plotting scales, and the cutting between the fingers and toes, were all done in the diorite by a cutting or scraping tool, and not by hammer and chisel. There is no trace of sawing at present visible on the statues.

The granite shrine of Ahmes (twenty-sixth dynasty), also in the Louvre, shows in the pivot-holes that tube-drilling was used as late as that period by the Egyptians.

Description of Plate II.[1]

Fig. 1. Sawing in granite, end of Great Pyramid coffer. Saw run too deep, twice over.

„ 2. Sawing in granite, with saw-cut across the block. Found at Memphis.

„ 3. Sawing in basalt; part of basalt pavement of ½ acre area at Gizeh, thus sawn.

„ 4. Sawing in basalt; same locality, showing lines of cutting well.

„ 5. Sawing in basalt; same locality, showing breadth of saw, cut into a slice sawn on both sides.

„ 6. Circular sawing in diorite. Found at Gizeh.

„ 7. Core of a tube drill hole in granite, showing deep cut spiral lines. Found at Gizeh.

„ 8. Section of tube drill hole in granite, showing core still in hole. Cast from Gizeh.

„ 9. Tube drill hole for hollowing alabaster mortar; broken in the making. Found at Kom Ahmar.

„ 10. Core of a tube drill hole in alabaster. The smallest known. Found at Memphis.

„ 11. Tube drill holes in an eye in marble. Showing thickness of tube. From Thebes.

[1] This Plate has been generously presented by the author.

Fig. 12. Tube drill hole in diorite, showing deep grooves of cutting. Found at Gizeh.

„ 13. Tube drill holes meeting in limestone, showing how nearly they were placed together. Found at Gizeh.

„ 14. Turning with two centerings, on a piece of diorite bowl. Found at Gizeh.

„ 15. Turning out of a diorite bowl, with fixed arcs of cutting. Found at Gizeh.

All the specimens from Gizeh are of the fourth or fifth dynasty; the others are of unknown dates.

Discussion.

Mr. John Evans complimented the author on the powers of observation he had shown in finding traces of the technical methods in use in ancient Egypt. Though inclined to accept the majority of his conclusions he differed from the author's views as to the method of drilling, by which such cores and cavities as those exhibited had been produced. Even had some extremely hard stone, such as the diamond, been inlaid in the ends of boring tubes, it would have been impossible to secure them inside tubes of a quarter of an inch in diameter. The conical shape, both of the holes and cores, implied a considerable waste of power, and this waste would only have been increased had the outside of the boring tubes been purposely studded with jewels. In saws and in boring tools of the present day, the cutting edge was intentionally made wider than the blade or stem, so as to diminish friction, and had the Egyptians adopted a crown of diamonds to their drills like those in use by the Diamond Boring Company of the present day, they would doubtless have adopted a similar precaution. Even with any amount of power and pressure, it would be impossible to bore so rapidly into hard diorite that the drill should advance at the rate of about one-twentieth of an inch at each revolution, as had been inferred by Mr. Flinders Petrie from the spiral grooves on the cores and on the sides of the circular holes. These grooves, however, were, in Mr. Evans's opinion, significant of the drilling tool having been a tube of some soft material—possibly soft copper or iron, or, as appeared to have been the case with the Swiss Lake dwellers, even of horn, which had been employed with some hard, gritty substance, such as corundum and water, and had thus ground down the circular channels. In grinding in this manner, there was a tendency for particles to follow each other along regular grooves, so that the sawn surface, as, for instance, of New Zealand jade, exhibited parallel striæ, which, however, afforded no indication of the rapidity with which the saw advanced in the stone. It was not improbable that the spiral grooves on the cores were made either in introducing the tube charged with fresh grinding material into the recess or in

withdrawing it when clogged. With regard to the diorite bowls, Mr. Evans mentioned the modern jade vessels made in China, which he believed were produced by the ordinary grinding process. He had himself made some experiments in boring with wood and bone instruments in stone, using sand as the abrading material, and he had found approximately parallel or partially spiral grooves produced on the inner surface of the hole, which bore no relation to the progress made in drilling. On the whole he thought that the method of drilling stone practised in Egypt must have had much analogy with that in use in early times in Switzerland and Northern Europe, and that corundum, rather than diamonds or any other jewels, was the actual abrading agent.

Mr. F. G. H. Price had listened with great interest to the valuable paper of Mr. Flinders Petrie, and had really very little to add; but he would be glad to be informed by Mr. Petrie whether he could say what had become of the many thousand implements used by the ancient Egyptians for stone-cutting purposes, as he was unaware of the existence of any in public collections.

Mr. E. P. Loftus Brock considered that the cuttings through the hard materials shown by Mr. Petrie indicated that the boring instruments must have had cutting edges harder than the materials cut through. The lines of cutting were exceedingly fine and true, and were not blurred or smoothed, as would have been the case had any, or much, sand been used to help the cutting. The presence of so many specimens on the table, or referred to by the lecturer, appeared to indicate a more rapid system of work than anything done by prehistoric tribes. Indeed, it would have been impossible by any of their processes to cut out the huge sarcophagi, or to have formed the platforms, &c., referred to. The discoveries made by Mr. Petrie appeared to open out a new page of Egyptian history, all the more remarkable since the discoveries referred to a remote period, when recorded history itself was beginning.

Mr. A. L. Lewis suggested that the question, how and where the quantity of cutting material necessary for executing the immense amount of work done by the Egyptians was obtained, was worthy of consideration. He thought Mr. Petrie's suggestion, that the Egyptians performed their great architectural feats at times when they could do nothing else, was a very happy one.

Mr. Rudler, while expressing his general admiration for Mr. Petrie's work, ventured to suggest that, on the assumption that the ancient Egyptians used diamond-mounted drill-heads, it would be difficult to conjecture whence the necessary supply of material could have been derived. This difficulty was increased by the fact that the ordinary crystalline form of diamond was found to be useless for drilling purposes, the only kind applicable to such work being the black *carbonado*—a mineral of exceedingly local occurrence in Brazil. He consequently thought it desirable to seek for some common material in a more accessible locality. The use of emerald seemed at first a feasible suggestion, inasmuch as this stone was largely worked by the ancient Egyptians. But

the speaker doubted—notwithstanding Pliny's reference to the remarkable hardness of the Egyptian *smaragdus*—whether so brittle a substance would be of much service in jewel-mounted drills. He therefore inclined rather to Dr. Evans's suggestion that corundum, in some form or other, was the agent most likely to have been used. Supplies of this material might readily have been procured from Ethiopia or from Armenia. The Armenian whetstones of Theophrastus were probably made of emery; Pliny speaks of the superiority of the Armenian *naxium*, and at one time it was imported into Greece, notwithstanding the proximity of the Naxos deposits. Probably the Armenian variety possessed superior hardness, toughness, and purity. It is doubtful whether the ancients made much use of diamond for working stone, and the Rev. C. W. King—our great authority on ancient gems—believes that the *adamas* of the early Greeks was corundum—the "adamantine spar" of some mineralogists even at the present day—rather than the true diamond. It had been suggested by Sir G. Wilkinson that the Egyptians in working hard stone used bronze tools supplied with emery powder. Without assuming that the ancients hardened copper in the way suggested by Mr. Duffield (Appendix to Dr. Schliemann's *Ilios*), it might be supposed that a comparatively soft metal, armed with particles of a hard mineral, would form a highly efficient agent. Dr. Evans had brought forward some striking illustrations of the work that may be accomplished when the matrix consists of such tissues as those of horn and wood. Mr. A. R. Wallace had described how the Uaupes in South America were able to drill holes in so hard a material as rock crystal, by the rotation of a pointed leaf-shoot of the wild plantain, worked with sand and water. The process had also been described by other travellers, who explained how the leaf-shoot of the *Urania Amazonica* was patiently rotated between the hands while the piece of stone was secured between the great toe and the second toe. These illustrations sufficiently proved that particles of an abrading material, embedded in a soft matrix, could drill into a substance quite as hard as itself, for the rock crystal was certainly as hard as the sand which attacked it. The subject of working hard stone by primitive peoples had recently been discussed with much ability by Dr. A. B. Meyer, of Dresden, in his valuable work on Jade.

Mr. Hyde Clarke suggested that the *naxium* of Armenia presupposed the emery mines of the island of Naxos, a chief source of supply to this day, and which were accessible to the Egyptians in early epochs when there was extensive navigation on the Mediterranean.

Professor Flower, Professor Boyd Dawkins, the Rev. Greville Chester, Mr. Park Harrison, and Mr. F. C. J. Spurrell also joined in the discussion.

Mr. Petrie, in reply, said that he had not intended to mention Sir Gardner Wilkinson, though he had his work in view; but as that had been alluded to, it should be noticed that he gave no explana-

tion whatever of the methods of stone cutting; he described some of the most evident results, without any technical criticism or research; and from his allusions to the choice of soft metal for *chisels*, to be used with emery *powder*, it is difficult to see what definite ideas he had of the capabilities or use of tools. Hard powder used with a chisel would be merely crushed up, without doing any work. Of his most valuable drawing of dressing the stone by means of a line and offset pieces, explained in this paper, he does not give even one word of description. Hence, saying here that his remarks on these subjects are only such as any intelligent traveller might make, is certainly not an over-strong statement. That setting the stones inside very small tube drills would be impossible, may be freely allowed; but no tapered cores under 2 inches diameter are known in hard stones; the small cores are all in alabaster, which could be readily drilled merely by sand. The setting of stones in the insides of the tubes would not be very difficult, either through larger holes in the opposite side, or else by cutting holes right through the metal. The great pressures alluded to were only for cutting in block; doubtless the delicate bowls were thinned off by grinding and polishing; and probably they would be filled solid with pitch during the final finishing. The disappearance of the tools is not to be wondered at. The specimens of work yet found are but a small fraction of what a single tool would cut out; and of the far commoner tools, as chisels, hammers, &c., there are but very few specimens known. The jewelled tools would be royal property, and would never be buried with the workman; and the bronze would be melted up, and jewels reset, again and again, as they wore out.

The following Paper was read by the author:—

On some PALÆOLITHIC KNAPPING TOOLS *and* MODES *of* USING THEM. By F. C. J. SPURRELL, Esq., F.G.S.

(WITH PLATE III.)

ALTHOUGH in many situations where implements of flint have been found in river-deposits, flakes or wasters and minor implements have been found also, yet there has been little success in getting the waste flakes and imperfect implements, together with the tools or knapping stones with which the much-desired hâche was formed.

It is obvious that where these remains are found in coarse gravel, there will be small chance of obtaining such particulars; and if so found there would be no proof that any particular knapper produced any particular flake, or was employed for any particular purpose. But on sandbanks, in out-of-the-way parts of a river-bed, and in retired situations, such remains

have been found; in fact, they are common and easy to find, and their relative age and positions at once suggest a close connection between them.[1]

Of the mode of producing flakes it is obvious that much may be inferred from the mere inspection of a flake; but when we consider the uniformity of the material we are surprised at the variety in the shape of implements and the difference in the style and method of chipping as practised by the old men.

When three years ago I found at Crayford a locality on the beach of a river, covered with a layer of chipped flints, I was able to show that the chipping had been done on the spot, and that no movement whatever of the remains had taken place since they were dropped by man.

All the stones had been obtained from the base of the chalk cliff, and it thus happened that the irregular staining of their surfaces by the iron from the gravel, helped materially in replacing the chips in their original form. The relics consisted of large and small flint flakes and minute chips, together with cores and spoilt hâches. With them I found hammers.

From the appearance of the flakes it was at once seen that several methods of workmanship had been practised, and this was more clearly brought out on their restoration into the original blocks.

In some cases the whole stone was split up into long, parallel, regular flakes (such an one I gave to Sir John Lubbock). In other stones the object was clearly to break the stone, but apparently without ulterior purpose as to the pieces detached, so coarse and clumsy were the results.

Other stones were broken evidently to obtain knife-like plates (which were afterwards carefully elaborated), and this was accomplished by means of a continual rectification of the superior (and necessary) plane of percussion from which the large flakes were struck.

In order to obtain a better stroke a continual lowering of that plane was practised by the freeing of minor flakes from it, parallel with its surface; each act of flaking, both horizontally and vertically, being frequently alternate. The restoration of flakes presents, consequently, a stair-like arrangement under this treatment.

[1] In searching the refuse of bone-caves, where flakes, knappers, and tools for working bone, &c., certainly lay with the general rubbish, it would seem that little care has hitherto been taken to collect and re-arrange them; it can only have been haste or carelessness, on the excavators' part, that lost so good an opportunity of obtaining those details which help to trace the turns of thought and ingenuity in overcoming those difficulties which enable us to distinguish the minor points marking the progress of man's mind. Though so much has been lost much may still be done, and it is to be hoped that in future greater care will be taken.

The hammers with which flaking was done were apparently ordinary flints. Such flints are much bruised at the *ends*, or the *edges* of the *end* of a long stone, broken across; and I think that this must have been their most common form, as it certainly produced the simplest kind of palæolithic chipping.

There can be little doubt that some large flints, which show a peculiar jarred appearance chiefly on flat or hollow parts, were anvils on which to rest the block.

Another method of working was to break off large or small pieces from the outside or crust of a nodule, with the ultimate purpose of getting at its interior. The flakes yielded by this method, from Crayford, as restored by me, show great irregularity of form and order of removal; they are usually broad and inelegant.

With these flakes were found two stones, which from their appearance I at once concluded to be hammers of a special shape. One of them is a green-coated flint of great toughness; it was chosen to suit the grasp of the hand, and was trimmed at either end to a suitable length. The thick layer of tough white crust on one side of it was peculiarly suitable, as resisting its own too rapid wear. It was not until this crust was worn down to the black flint that the hammer was thrown aside.

Another small chalk flint was evidently tried, but being of the ordinary kind was speedily thrown aside as unsuitable or worn out.

It became necessary to discover how this hammer was used, which I am able now to say I have done. By making experiments on this form of hammer (fig. 1, Plate III), and procuring a similar piece of stone, I succeeded in producing similar work. There was no anvil needed in this work.

The block of stone to be operated on being held in the left hand was struck by a long swinging sweep of the right hand holding the hammer, in the way a violin bow is held (in the direction of the arrow in fig. 2, Plate III). It is evident that in general the lower surface of a long hammer passing lengthways over the edge of the block would merely strike the thin edge, at (*a*), and that unless an irregularity in the hammer happened to hit further back, a flake, properly speaking, would not be detached. In order, therefore, that the hammer should strike the right spot (*b*) at once, the projecting edge (*a*) was chipped or trimmed slightly, so as to remove the projection in the line of stroke back to (*b*), at the same time roughing the surface and enabling the hammer to get a "grip": this being done the flank was successfully detached.

That this method was actually employed may be distinctly shown by the fact that many of the flakes, when placed together,

show the trimming above described passing continuously across the base of both of them: thus they were chipped in a preparatory way more or less, or not at all, as occasion required.

One of the flakes, from which a smaller splinter has separated after it had reached the ground (the result of continued action of the blow which severed the flake from the block, and which, therefore, could never have been used), is much roughened by this chipping.

In arranging the flakes for the restoration, most of which had fallen to the ground at once, some could not be found, and this is explained by the fact that when imitating the use of the hammer above described, occasionally a flake flew to a great distance: one flew with a fearful whirr a distance of over 60 feet; doubtless this incident occurred to the old men. Notwithstanding that these flakes, on their first exhibition, were at once identified by a very high authority as having been "used," it is evident that the chipping at their bases is not the result of wear, but is merely a detail of manufacture.

I was enabled, by a careful examination of the surface, to see from the disposition of a heap of flakes, which lay divided by two slight lines and other signs, that the operator *sat* on the sand with his legs but slightly apart.

Sometimes stones nearly of the size and shape of the implement required to be formed were selected, and the crust removed wholly or in part from the surface. It does not appear that any of the crust was retained for a purpose, as in almost every case where the chipper was sufficiently skilled the whole was removed. I have seen many spoilt tools broken, in the apparent endeavour to remove some such blemish, which were otherwise perfect.

Since the Crayford find I have met with several floors where men wrought, and in one, which I succeeded in keeping somewhat to myself for a time, I observed some fresh details.

This was at Northfleet; it, like the last, was a river beach, perhaps dry in summer and subject to floods;—though, subsequently to the deposition of the refuse, some of the ground has been pushed about by ice, yet the immense quantity of flakes (cartloads), and other signs of man's occupation, furnish abundant evidence that he lived near, and worked on the spot.

These flakes are of all sizes, from over 3 lbs. in weight to a grain or two. Some are of great age, and have travelled far or lain long kicking about on the shingle, while others are as sharp as if made to-day; of the latter, some are clumsy, and some long, thin, and very straight.

Besides the ordinary method of chipping, that is, of hitting one stone with another in a manner not requiring much technical

ability, at this spot a hammer was employed (fig. 6) which I have not noticed elsewhere. Many stones (flint) were found whose characteristic may be summed up by saying that they were pointed (and *the* point much used). In their best form they resembled kites, though they frequently were but long flints (a not unusual form), chosen for their weight and the possession of a good point, which, if not existing, was trimmed up; in weight they ran up to 10 lbs. Some of them were, however, not strictly pointed, but broken obliquely to the length, the part used being the projecting edge.

At this place, in the ordinary way of making a hâche, a stone was shaped and finished at the butt; in finishing the tip, however, by means of striking longitudinal flakes from a small surface left at that end, a heavy, sharp-pointed hammer was needed for the exact delivery of the blow, such as those before described. When the blow was true, and the tilt of the surface right, all went well; but it was not always so, and by means of spoilt implements I am able to show that the tilt was not always rectified, or the blow delivered with exactitude. Thus the striking off of too thick and large a flake, and the consequent spoiling of the implement, sometimes happened. This may have occasionally resulted from the hammer being worn out.

Another mode of manufacture largely depended on these sharp-pointed hammers. A flint stone being selected, and trimmed coarsely round the sides, was worked on its upper surface into the form of a flat dome; then from one end the whole of this prepared surface was detached by a single blow (fig. 5), producing, when the operation had been well conducted, a "turtle-backed" flake, with a flat surface on the other side (figs. 7 and 8).

In this and the before-mentioned uses of this kind of hammer, it is remarkable how much preparation and labour depended for its ultimate success on adroitness in the delivery of a single stroke! Many flakes were worthless, and were cast aside, but of those which were retained as suitable, two uses were reserved. Some were trimmed round the edges, mostly at one end and the sides, the other end or some part being left untrimmed, as if left for handling without inconvenience. This trimming was not needed so much at first when exquisitely sharp, as afterwards when the edge was lost by use. The trimming is invariably on one side alone (the raised one). I have called these "turtle-backed scrapers" (see figs. 7 and 8).

I think that though trimmed to keep the edge sharp, they would be less efficient than when new. These stones, which might equally be skinning implements, or sleeks (slicks) for dressing skins, were admirably adapted for the first purpose.

An ordinary flake, used to skin an animal, would as frequently cut upwards through the skin, as down on the bones or subjacent tissues, and would be less governable and more dangerous to the integrity of the skin in proportion to its sharpness; but these turtle-backed flakes, held with their rounded (or bevelled) sides towards the skin, could only cut *downwards*, and if they slipped could not perforate or injure it, a matter of extreme importance in those times. For the second use, that of currying and scraping, it being a less delicate operation, they would be well fitted.

A large number of the flakes at Northfleet showed signs of having been "worked." Some were what are called round or thumb scrapers, others present a straight edge, and some resemble the so-called hollow scrapers, and doubtless many might have been used for scraping bone and wood into shape. On examination, however, it is perceived that most of these implements show all the chipping to be on one side only, that it is sharp and unpolished, the hollow is very wide, and placed much to one end: these points do not agree with the shapes or uses of scrapers. They are not scrapers, but *knappers* (fig. 3). In consequence of this surmise, whilst trying to make a flat flake into a round scraper with another simple flake, I found that by resting one horizontally on a point of stone or wood, and striking it with the edge of another in a direction downwards, and slightly away from me, I could easily imitate to perfection many found at Northfleet, while on a repetition of the operation with the same knapper, I found its action improved, until at last it was difficult to tell the original from my own by the form alone.

So necessary was the deep hollow to success in their use that flakes were chosen which had a slight accidental hollowing. Some were left-handed in use. Their weight runs from about an ounce up to 8 lbs., and apparently the large ones must have been used in making hâches, some stones presenting signs of such treatment. It appears likely that the turtle-backed flakes were trimmed by this means occasionally.

I have never found any stones, other than flint, that have been used for the purpose of knapping or striking off flint flakes on river-banks, though tough pebbles of quartz, sandstone, &c., are common enough, and when these have presented signs of wear it was of that kind resulting from pounding some comparatively soft substance on another stone. I obtained the tools exhibited from the beds with my own hands; in truth, had I not done so, I should not have considered them worthy of the attention of this Institute; and I felt the necessity, on this occasion, of being able to say this, even if it entailed the omission of a few better examples than those present.

Fig. 1.

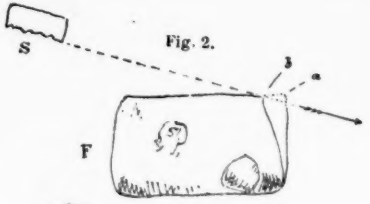


Fig. 2.

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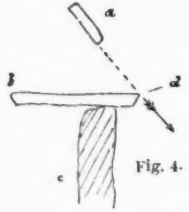

Fig. 4.

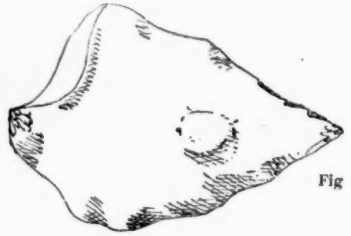

Fig 6.

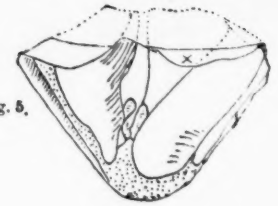

Fig. 5.

Fig. 7.

Fig. 8.

Fig. 9.

FLINT HAMMERS, WITH ILLUSTRATIONS OF THEIR USE.

The restriction which I thus placed upon myself has prevented some further observations being made, of an inductive and experimental nature, on palæolithic as well as later stone-working.

Description of Plate III.

Fig. 1. Stone hammer from Crayford; 3·8 inches long, 6·7 inches in circumference.

„ 2. Diagram explanatory of the use of the hammer (fig. 1). S represents the hammer, and F the block of flint.

„ 3. Flat flake of flint chipped by use into a hollow on one edge; there are no signs of chipping on the other side. This is a good example of the common form, the larger ones are less elegant.

„ 4. Diagram representing the manner of using the flake (fig. 3). It is held (the worked part upward) by the right hand at *x* in the position *a*. Another flake to be trimmed is held by the left hand at *b*, resting on a piece of wood; *b* being struck at *d* by the downward motion of *a*, the chips fly from the unopposed surfaces of each flake.

„ 5. A block of flint trimmed at the sides and at the top, where the form is indicated by dotted lines. This upper part is struck at one blow, at the spot marked × by fig. 6.

„ 6. A hammer, which was used at the pointed end, to ensure accuracy; the blunter end may also have been used. This is the most usual form.

Figs. 7 and 8. A tool made from a flake resembling the upper part of fig. 5. The flat side is left unworked; the other is trimmed to a regular form, and served as a slick or skinning implement.

Fig. 9. Also made from a flake like the upper part of fig. 5. It is, however, worked on both sides into a hâche; this tool is in admirable preservation.

N.B.—The above outlines (figs. 2 to 9) are drawn from actual specimens, on a scale of one-fourth natural size (linear).

Discussion.

Mr. W. G. Smith drew attention to the fact of quartzite pebbles, with abraded ends, being found in neolithic positions, such pebbles being generally accepted as hammer-stones, for flaking and pounding. Quartzite, he said, was specially useful for this purpose, being hard and tough, whereas flint is brittle. Mr. Smith exhibited quartzite pebbles, with the ends abraded off, from palæolithic positions, and he said if they were accepted as hammers when found with neolithic objects they had an equal claim to be considered hammers,

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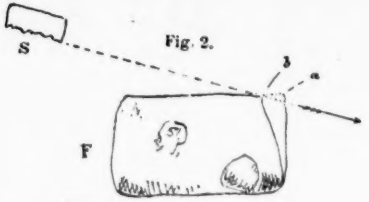

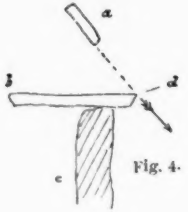

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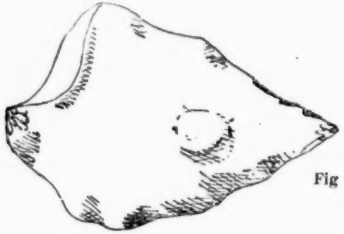

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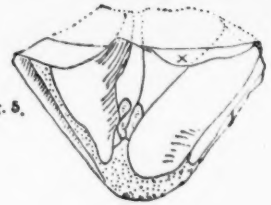

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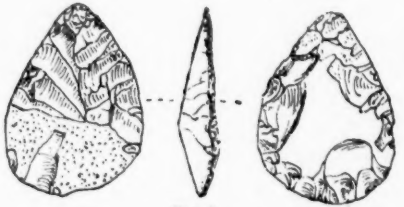

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Discussion.

Mr. W. G. Smith drew attention to the fact of quartzite pebbles, with abraded ends, being found in neolithic positions, such pebbles being generally accepted as hammer-stones, for flaking and pounding. Quartzite, he said, was specially useful for this purpose, being hard and tough, whereas flint is brittle. Mr. Smith exhibited quartzite pebbles, with the ends abraded off, from palæolithic positions, and he said if they were accepted as hammers when found with neolithic objects they had an equal claim to be considered hammers,

when found with palæolithic implements. Mr. Smith exhibited some finely chipped palæolithic implements, and said it seemed impossible that such minute flakes had ever been detached from the tools by hammering at all. He believed all the small flakes were pushed off, as some savages now push off small flakes in making stone tools. In support of this he referred to the neolithic tools, termed "fabricators" by Dr. John Evans, and said that tools of a very similar character were found in palæolithic gravels: some of these he produced, and said, if the former small tools were used for tapping and pushing off small flakes, it seemed reasonable to consider that the palæolithic examples were used for a similar purpose. He agreed with Mr. Spurrell that hammer-stones of flint were often used in palæolithic times, and anvil-stones, as described by Mr. Spurrell, exhibiting distinct marks of percussion from hammer-stones, he had many times seen on the palæolithic floor discovered by himself at Stoke Newington Common.

Professor FLOWER, Professor BOYD DAWKINS, and Mr. PARK HARRISON took part in the discussion, and the author briefly replied.

ANTHROPOLOGICAL MISCELLANEA.

The Varini, Varangians.

To the Editor of the "Journal of the Anthropological Institute."

Sir,—Mr. Howorth, in his paper, "The Varini, Varangians, and Franks," Vol. xii, No. iv, p. 536, has referred to me in relation to the identity of the Carini and the Angli, proposed by me.

He quotes therein, "See Hyde Clarke on the 'Settlement of Britain and Russia,' Trans. R.H.S., vii, 254."

He has not pointed out that in those late "Transactions of the Royal Historical Society," p. 254, will be found the same materials, identifying the Varini and the Varangians, as are given by Mr. Howorth in our "Journal," pp. 525–553.

Neither has he informed us that the whole subject was brought by me before our members in 1868, and will be found in Vol. vii of the "Journal of the Ethnological Society," for the year 1879, pp. 60–91. My title is "The Varini, or Warings, and their Relations to English Ethnology."

In the same volume is a paper by Mr. H. H. Howorth, which will serve to bring it more clearly to his memory.

Your obedient servant,

Hyde Clarke.

32, St. George's Square, S.W.,
12*th June*, 1883.

Stone Implements from India.

Mr. H. Rivett-Carnac, F.S.A., has been good enough to send to the Anthropological Institute a small collection of stone implements from India, accompanied by a letter from which the following extracts are taken:—

"During the past few years Mr. J. Cockburn and myself have been fortunate enough to find stone implements in large quantities in Banda, a hilly district of the North-Western Provinces of India. These implements consist chiefly of stone axes, or celts, of types well known in Europe. We have also found stone hammers, ring-stones, and a variety of other implements, some of cosmopolitan types and others unique.

"The celts found are upwards of 400 in number, and are of two distinct types, polished and chipped; the former of diorite and the latter of basalt. We are of opinion that both types were in use at the same time. Implements of true palæolithic types, made of quartzite, occur scantily in the Banda district, but are more numerous further south. The celts vary from $12\frac{1}{4}$ inches in length and 8 lbs. 3 oz. in weight, to $2\frac{1}{2}$ inches in length and $3\frac{3}{4}$ oz. in weight. The unique specimens of hammers, &c., and the largest and most remarkable of the celts, have been presented by me to the British Museum.

"A larger collection of *chert* implements than has hitherto been made in India has been brought together by Mr. Cockburn, who will describe them more fully at a later date. The ethnic affinities of the collection are, he points out, curious. On the one hand the scrapers and knives are of European types, as are also the mass of the celts. Then there are certain types which clearly resemble chert implements, hitherto found only in Egypt by Mr. Jukes Brown ('Journ. Anthrop. Inst.,' Vol. vii). A third type, apparently not common elsewhere, which he designates the 'saw-backed knife,' has recently been found in the Island of Melos. The coarser kinds of stone knives of quartz, sandstone, and basalt, are not far removed from those used by the modern Australian savages.

"The arrow-heads, as far as can be judged, come nearer to the multitudinous American forms than to any other; but the resemblance may rather be due to the comparatively large number of these implements which are known from America, and their comparative rarity in other countries. Some of the chert implements are of recent origin, and we have come to the conclusion that they were probably in general use among the Kolairian or Dravidian aborigines of this part of Bundel Khund about 500 B.C., and that the use of stone among these people was not quite abandoned as late as 600 A.D.

"A piece of sculpture, representing an aborigine, *armed with a stone axe*, recently discovered at Kalinjar, is assigned to the seventh century after Christ. How far antecedent the use of stone may have been in this part of the country no one will venture to guess in the present state of our knowledge, but the majority of the implements have been found on the borders of the great Gangetic alluvial plain—itself of no great antiquity.

"The alluvium in this part of Bundel Khund is largely made up of decomposed basaltic rocks, which crop up here and there to the very margin of the Jumna. No doubt this river has had much to do with the level and adjustment of this alluvium.

"Some of the chert implements, which are much weathered, are doubtless of vast antiquity; but the evidence, as far as it has been sifted, is in favour of the view that the people, corresponding to the palæolithic men of Europe, used excessively rude implements of jasper, quartzite and basalt, rather than chert, which is by no means abundant."